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Carpenter, Nathaniel

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GEOGRAPHIE DELINEATED FORTH IN TWO BOOKES.

CONTAINING

The Sphericall and Topicall parts thereof,

By NATHANAEL CARPENTER, Fellow of
Exceter Colledge in Oxford.

THE SECOND EDITION CORRECTED.

ECCLESIAST. 1.

*One generation commeth, and another goeth, but
the Earth remayneth for euer.*

OXFORD,
Printed by *John Lichfield*, for *Henry Cripps*, and are to be ſold by
Henry Curteyne. *Anno Domini*, M. DC. XXXV.

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RPJCB

TO THE
RIGHT HONOVRABLE
WILLIAM,
EARLE OF
PEMBROKE, LORD CHAMBERLAINE
to the Kings moſt excellent Maieſty, Knight of
the moſt Noble Order of the Garter, and
Chancellour of the Vniuerſity
of Oxford.

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Right Honourable,

THis poore Infant of mine, which I now offer to *Your Honourable* acceptance, was conſecrated *Yours* in the firſt conception: If the haſty deſire I had to preſent it, makes it (as an abortiue brat) ſeeme vnworthy my firſt wiſhes, and Your fauourable Patronage; impute it (I beſeech You) not to *Selfe-will* but *Duty*; which would rather ſhew herſelfe too *officious*, then *negligent*. What I now dedicate rather to Your *Honour*, then mine owne *Ambition*, I deſire no farther to bee accompted *Mine*, then *Your* generous approbation: wiſhing it no other fate, then either to *dye* with Your Diſlike; or *liue* with Your Name and Memory. The generall Acclamation of the Learned of this Age, acknowledging with all thankefull Duty, as well Your Loue to *Learning*, as Zeale to *Religion*, hath long ſince ſtampt me *Yours*. This arrogant Deſire of mine, grounded more on *Your* Heroicke vertues, then my priuate ends, promiſed mee more in *Your* Honourable Eſtimation, then ſome others in Your Greatneſſe. The expreſſion of my ſelfe in theſe faculties beſide my profeſſion, indebted more to Loue, then Ability, ſetts my Ambition a pitch higher then my Nature. But ſuch is the Magnificent ſplendour of *Your* Countenance, which may eaſily lend *Your* poore Seruant ſo much light as to lead him out of Darkneſſe; and, as the Sunne reflecting on the baſer earth, at once both view and guild his Imperfections. My language and formality I owe not to the *Court*, but *Vniuerſity*; whereof I cannot but expect *Your Honour* to be an impartiall Vmpier, being a moſt vigorous *Member* of the one, and the *Head* of the other Corporation. If theſe fruites of my Labours purchaſe ſo much as *Your Honours* leaſt Approbation, I ſhall hold my wiſhes euen accompliſhed in their ends, and deſire only to be thought ſo worthy in *Your* Honourable eſteeme, as to *liue* and *dye*

Your Honours in all duty and
ſeruice to bee commanded

NATHANAEL CARPENTER.

The Analyſis of the firſt Booke.

Geography, whoſe obiect is the whole earth, is either

- Sphericall, which is two-fold either
  - Primary, which conſiders the Terreſtriall Spheare either as it is
    - Naturall wherein are to bee conſidered two things: the
      - Principles whereof it conſiſts, to wit, Matter and Forme. Chapter 1.
      - Proprieties ariſing out of them; which againe are either
        - Reall: ſuch as are aſſigned in reſpect of the
          - Earth it ſelfe: which are either
            - Elementary: as the conformity of all the parts concurring to the conſtitution of the Spheare. Chapter 2.
            - Magneticall; which are either
              - Partiall as the Coition, Direction, Variation, Declination: Chap. 3.
              - Totall: as the Verticity and Reuolution: Chap. 4.
          - Heauens: wherein we treate of the Site, Stability, and proportion of the Earth in reſpect of the Heauens. Chap. 5.
        - Imaginary: ſuch as are the Circles and Lineaments of the Globe, of whoſe Inuention and Expreſſion. Chap. 6.
    - Artificiall: in the Artificiall Spheare repreſenting the Naturall vnto vs: which is either Common or Magneticall. Chap. 7.
  - Secondary, which handles ſuch matters in the Spheare as ſecondarily ariſe out of the firſt. Such are
    - Meaſure of the Earth, with the diuerſe manner of Inuention. Chap. 8.
    - Diſtinction which are either
      - Spaces conſidered
        - Simply in themſelues, in which ſort they are diuided into Zones, Climates, and Parallels. Chap. 9.
        - In reſpect of the Inhabitants: which ſuffer manifold Diſtinction. Chap. 10.
      - Diſtances which are either
        - Simple: wherein is conſidered the Longitude & Latitude of places. Chap. 11.
        - Comparatiue: wherein two places differing either in Longitude or Latitude, or both, are conſidered. Chap. 12.
- Topicall *Libro 2°.*

Place this Analyſis after the firſt Epiſtle.

OF THE SPECIALL Contents of each Chapter of the firſt Booke according to the ſeuerall Theoremes.

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CHAP. I.

Of the Terreſtriall Globe, the Matter and Forme.

1 IN the Terreſtriall ſpheare is more Earth then Water. pag. 8
2 The Earth and Water together, make one Spheare. pag. 10

CHAP. II.

Of the Conformity of parts in the conſtitution of the Terreſtriall Spheare.

1 *The parts of the terreſtriall ſpheare doe naturally conforme and diſpoſe themſelues, as well to the Production and Generation, as to the continuance and preſeruation of it.* pag. 14
2 *All Earthly bodyes incline and approach to the center as neere as they can.* 16
3 *Of two heauy Bodies, ſtriuing for the ſame place, that alwayes preuaileth, which is heauieſt.* 22
4 *Hence it comes to paſſe, that the Earth enioyes the loweſt place,*

the next the Water, and the laſt the Aire. ibid.
5 The Center of the Earth is not an Attractiue, but a meere Reſpectiue point. 25
6 The ſame point is the center of Magnitude, and weight in the Terreſtriall ſpheare. 26
7 Euery point or center of a weighty body, is moued towards the center of the terreſtriall Globe by a right line. 27
8 A heauy point mouing toward the center, will moue faſter in the end, then in the beginning. 28
9 The motion of a magnitude towards the center, is not meerely naturall, but mixt with a violent motion. 29
10 The lines wherein the centers of two heauy bodyes are moued downewardly, being continued, will meete in the center of the Earth. 31
11 Two heauy bodies of the ſame figure and matter, whether equall or vnequall, will in an equall time, moue in an equall ſpace. 32
12 The Terreſtriall Globe is round and ſphericall. 33
13 The Rugged and vnequall parts of the Earth, hinder not the ſphericall roundneſſe of it. 36
14 The Water concurring with the Earth in the Globe, is alſo ſphericall. 38

CHAP. III.

Of the Partiall Magneticall affections in the ſpheare of the Earth.

1 The Terreſtriall ſpheare is of a magneticall Nature and diſpoſition. pag. 46
2 The magneticall motion is excited in a ſmall and vnperceiuable difference of time. 49
3 The motiue quality is ſpread ſpherically through euery part of the magneticall body. 49
4 The motiue quality of the magneticall body, is ſtrongeſt of all in the poles, in other parts ſo much the ſtronger by how much they are ſituated neere the poles. 50
5 Magneticall bodies moue not vncertainly, but haue their motions directed and conformed to certaine bounds. 52
6 The

6 *The Magnet communicates his vertue to iron or ſteele, if it be touched with it.* 55
7 *The Magneticall Coition is ſtrongeſt of all in the poles.* 56
8 *The South part of the Loadſtone turnes to the North, and the North to the South.* 57
9 *The contrary motion in magnets is the iuſt Confluxe and Conformity of ſuch bodies to magneticall vnion.* 59
10 *If any part ſouthward of the magneticall body be torne away or diminiſhed, ſo much ſhall alſo be diminiſhed of the North part.* 50
11 *The Magneticall variation hath no certaine Poles in the terreſtriall Globe.* 61
12 *The point of Variation, as of Direction, is onely Reſpectiue not attractiue.* 65
13 *The variation of euery place is conſtant not variable.* 66
14 *The variation is greater in places neere the poles.* *ibid.*
15 *The magneticall Declination is anſwereable to the Latitude, not in equality of degrees, but in proportion.* 69
16 *The magneticall declination is cauſed, not of the attractiue, but of the Diſponent and Conuerſiue vertue of the Earth.* 70
17 *The Magneticall Declination hath a variation.* 71

CHAP. IV.

Of the totall Motions Magneticall.

1 *The ſpheare of the Earth by her magneticall vigour, is moſt firmely ſeated on her Axell, whoſe ends or poles reſpect alwayes the ſame points in the Heauens without alteration.* 72
2 *It is probable, that the terreſtriall Globe hath a circular Motion.* 76

CHAP. V.

Of the ſite, Stability, and Proportion of the Earth in reſpect of the Heauens.

1 *The terreſtriall Globe is the center of the whole world.* 99
2 *The poſition of the Earth in the center of the world may bee reconciled,*

conciled, as well with the diurnall motion of the Earth, as the Apparences of the Heauens. 110
3 *The Earth is firmely ſeated and ſetled in her proper place.* 115
4 *The Earthly Globe compared in quantity with the Firmament, & ſupreme orbes of the Planets, hath no ſenſible magnitude.* 118
5 *The terreſtriall Globe compared with the inferiour Orbes hath a ſenſible magnitude.* 121

CHAP. VI.

Of the circles of the Terreſtriall Spheare.

A circle though imaginary in it ſelfe, hath his ground in the nature of the terreſtriall ſpheare. 123
The diſtinction of a circle into a certaine number of parts hath no certaine ground in the nature of the terreſtriall ſpheare, but onely in conueniency. 124
3 *By Aſtronomicall obſeruation to find out the Meridian.* 127
4 *To find out the Meridian magnetically.* 129
5 *By the Inciſion of a tree, the Meridian may be found out.* 131
6 *The Meridian being found to find out the Equatour.* 137
7 *Without the helpe of the Meridian to find out the Equatour.* 138
8 *To find out the Equatour magnetically.* 138
9 *The Equatour is an vnmoueable circle, whoſe Poles neuer vary from the Fixt-Poles of the Earth.* 140
10 *How to know the number of degrees in a leſſer circle anſwerable to the greater.* 147
11 *The ſenſible and Rationall Horizon in the Earth, are much different: in reſpect of the Firmament all one.* 151
12 *The ſenſible Horizon may be greater or leſſe, according to the Nature and Diſpoſition of the place.* 153
13 *the Eye may be ſo placed on the Earth, as it may behold the whole Hemiſpheare of the Heauens, and yet no part of the terreſtriall ſpheare.* 154
14 *From the Horizontall circle is reckoned the Eleuation of the Pole in any place aſſigned.* 155
15 *How to finde out the Horizon for any place aſſigned.* 156

16 *How*

16 *How to finde out the Horizontall plaine.* 157
17 *The diſtinction of Horizons.* ibid.

CHAP. VII.

Of the Artificiall Repreſentation of the Terreſtriall ſpheare.

1 *Of the parts whereof the Globe is Geographically compounded.* 163
2 *The vſe of the Artificiall Globe is to expreſſe the parts of the Earth, ſo farre forth as they haue a diuerſe ſituation, as well one in reſpect of the other, as the Heauens.* 166
3 *Of the direction of the artificiall Globe.* ibid.
4 *Of the ground and fabricke of the Artificiall plaine Chart.* 168
5 *Of the ground and fabricke of the Geographicall Planiſpheares with their ſeuerall diſtinctions.* 175
6 *Of the magneticall Terrella.* 182

CHAP. VIII.

Of the meaſure of the Earth.

1 *The common meaſures by which the quantity of the Earth is knowne, are miles, and furlongs.* 187
2 *Of the inuention of the circumference of the Earth.* 188
3 *By the eleuation of the Pole, or obſeruation of an Eclipſe or ſome knowne ſtarre the circuite of the Earth may be knowne.* 189
4 *By obſeruation of the noone-ſhadowes the meaſure of the earth may be found out.* 190
5 *The opinions of Coſmographers concerning the meaſure of the Earth are diuerſe, which is chiefly to bee imputed to their errour in obſeruing the diſtances of places experimentally, according to Miles, Furlongs, and ſuch like meaſures.* 192
6 *How by the knowne height of ſome mountaine the diameter of the Earth may be found out.* 197
7 *How to finde out the plaine and conuey ſuperficies of the Earth.* 198

8 *Of*

8 *Of the number of ſquare miles contained in the Earth.* 200

CHAP. IX.

Of the Zones, Climates, and Parallels.

1 *Of the temperate and vntemperate Zones.* 204
2 *The torride Zone is the greateſt of all: next are the two temperate: the cold Zones are the leaſt of all.* 207
3 *The Zone wherein any place is ſeated, may be knowne either by the Globe, or Geographicall table, or elſe by the tables of Latitude.* 208
4 *The Zones and Climates agree in forme, but differ in greatneſſe, Number, and Office.* 211
5 *The Inuention compared one with the other, are not all of the ſame greatnes.* 212
6 *The inclination of the Climates.* ibid.
7 *The diſtinction of the Climates.* 213
8 *Of the diuerſity betwixt the Ancient and moderne Geographers, concerning the placing and number of the Climates.* 214
9 *How to find out the Parallell for each place.* 217

CHAP. X.

Of the diſtinction of the Inhabitants of the Terreſtriall ſpheare.

1 *Of the inhabitants of a right, oblique, and Parallell ſpheare, with their properties and diſtinctions.* 220
2 *Of the* Amphiſcij, Heteroſcij, & Periſcij, *with their properperties.* 226
3 *Of the* Periœcj, Antœcj, *and* Antipodes, *with their Accidents:* 228
4 *How the* Periœcj, Antecj *and* Antipodes, *are diſtinguiſhed in reſpect of the celeſtiall Apparences.* 231

CHAP. XI.

Of the Longitudes and Latitudes.

1 *Places enioying the ſame longitude, are not alwayes equally diſtant from the firſt Meridian; and contrariwiſe.* 235

2 *The difference of Longitudes begetts the difference of times.* 235

3 *Of the looſing or getting of a day in the whole yeere in a voyage about the earthly Globe.* 236

4 *Of the Inuention of the Longitude by an Eclipſe of the Moone.* 240

5 *Of the Inuention of the Longitude by a Clocke, watch, or Houre-glaſſe.* 242

6 *By the diſtance betwixt the Moone and ſome knowne ſtarre, to find out the Longitude.* 243

7 *By the difference of the Sunnes and Moones motion, to find out the Longitude of places.* 246

8 *The expreſſion of the longitude by the Globe or Mappe.* 247

9 *The Inuention of the Latitude.* 249

10 *By the Meridian height of the Sunne to find out the Latitude.* 249

11 *By the Meridian height of a knowne ſtarre to know the Latitude.* 250

12 *The expreſſion of the Latitude on the Globe or Mappe.* 252

13 *Of the Magneticall expreſſion of the Latitude.* 252

CHAP. XII.

Of diſtances of places compared one with the other.

1 *Of the Inuention of the diſtances in longitude of two places vnder the Equatour in the ſame Hemiſpheare.* 254

2 *Of the Inuention of the diſtance of two places in the ſame Hemiſpheare without the Equatour.* 255

3 *Of the diſtance of places differing only in longitude, in diuerſe Hemiſpheares.* 260

4 *Of the inuention of places differing onely in Latitude, either in the ſame or diuerſe kindes of Latitude.* 261

5 *To find out the diſtance of places differing in Longitude and Latitude*

titude by the ſquare roote. 262
6 *How to performe the ſame by the tables of Signes, Tangents, and Secants.* 264
7 *To find out the diſtances of places by reſolution of the ſphericall Triangle.* 266
8 *Of the Inuention of the diſtance by the Semicircle.* 271
9 *Of the expreſſion of the diſtance on the Globe or Mappe.* 273

To my Booke.

PArue, nec inuideo, ſine me (Liber) ibis in *Aulam*,
Hei mihi quòd *Domino* non licet ire tuo.

Goe forth thou hapleſſe Embrion *of my Braine,*
Vnfaſhion'd as thou art; expreſſe the ſtraine
And language of thy diſcontented Sire,
Who hardly ranſom'd his poore Babe *from fire,*
To offer to the world and careleſſe men
The timeleſſe fruits of his officious pen.
Thou art no louely Darling, ſtampt to pleaſe
The lookes of Greatneſſe*; no delight to eaſe*
Their melancholy temper, who reiect
As idle toyes but what themſelues affect.
No lucky Planet *darted forth his Rayes*
To promiſe loue vnto thy infant-dayes:
Thou maiſt perhaps be marchandize for ſlaues.
Who ſell their Author's wits and buy their graues:
Thou maiſt be cenſur'd guilty of that blame,
Which is the Midwifes *fault, the* Parent's *ſhame:*
Thou maiſt be talke for Tables*, vs'd for ſport*
At Tauerne-*meetings, paſtime for the* Court*:*
Thou maiſt be torne by their malicious phangs,
Who nere were taught to know a Parents pangs.

How eas'ly can proud Ignorance *out-ſtare*
The comelieſt weeds thy pouerty can weare;
When all the Siſters *on our* Iſis *ſide*
Are oft ſworne ſeruants to aſpiring pride,
And our renowned Mother Athens *groanes*
To ſee her garden ſet with Cadmus *ſonnes:*
Whoſe birth is mutuall ſtrife: whoſe deſtiny
Is only to be borne, to fight, and dy.
Prometheus *is chain'd faſt, and cannot moue*
To ſteale a little fire from mighty Ioue
To people new the world; that we may ſee
Our Mother teeme with a new progenie;
And therefore with thy hapleſſe Father proue
To place thy duty where thou findeſt loue.
When thou arriu'ſt at Court *thou long may'ſt ſtay*
Some Friends *aſſiſtance to prepare thee way;*
As in a clowdy morning I haue done
When envious Vapours *ſhut me from the* Sunne.
When all elſe enter, ſee thou humbly ſtand
To begge a kiſſe from thy Mæcenas *hand;*
If he vouchſafe a looke to guild thy ſtate,
Proclayme him Noble, *thy* ſelfe *fortunate.*

GEOGRAPHIE:
THE FIRST BOOKE.

CHAP. I.

Of the Terreſtriall Globe, the matter and forme.

1 GEOGRAPHIE is a ſcience which teacheth the deſcription of the whole Earth.

The Nature of *Geographie* is well expreſſed in the name: For *Geographie* reſolued according to the *Greeke* Etymologie, ſignifieth as much as a deſcription of the Earth; ſo that it differs frō *Coſmographie*, as a part from the whole. Foraſmuch as *Coſmographie* according to the name, is a deſcription of the whole world, cōprehending vnder it as well *Geograghie*, as *Aſtronomie*. Howbeit, I confeſſe, that amongſt the ancient Writers, *Coſmographie* hath been taken for one & the ſelfe-ſame ſcience with *Geographie*; as may appeare by ſundry treatiſes meerely Geographicall, yet intituled by the name of *Coſmographie*. This Science (according to our approued *Ptolomie*) is diſtinguiſhed from *Chorographie* foure wayes.

Ptolom. geogr. l. 1. *ſec.* 1.

Firſt, becauſe *Geographie* deſcribeth the whole Spheare of the Earth, according to its iuſt *quantity, proportion, figure,* and *diſpoſitions,* which the principall parts of it haue; as well in reſpect of one another, as of the whole Terreſtriall Globe: ſo that it only vndertakes the chiefe and moſt noted parts, ſuch as are ſines, creekes, nations, cities, promontories, riuers, and famous mountaines. But the *Chorographer* ſeparatly handleth the leſſer parts, and matters of ſmaller moment, ſuch as are hillocks, brooks, lakes, townes, villages, and Pariſhes, without any reſpect at all to the places adioyning, as conferring them with the *Sphæricall* fabricke of the whole Earth: Which by the ſame Author is well illuſtrated by an example, drawne from the Painters Art: For wee ſee that a Painter, deſirous to draw out and repreſent the head of any liuing creature, will firſt draw out the lineaments of the firſt and greateſt parts; as the eyes, eares, noſe, mouth, forehead, and ſuch like; only caring that they may challenge a due and iuſt proportion and ſymmetrie one with the other, not regarding the leſſer particles and ornaments in each of theſe, wanting perhaps ſpace competent to accompliſh it. But if the ſame Painter would ſtriue to expreſſe only an eye, or an eare, he might take ſpace enough to deſigne out euery ſmaller lineament, colour, ſhadow, or marke, as if it were naturall: for in this he cares not to make it correſpondent to the whole head, & other parts of the body: So happens it to the *Geographer*, who willing to delineate out any part of the Earth, (as for example, our Realme of *England*) he would deſcribe it as an Iland, encompaſſed round with the ſea, & figured in a triangular forme, only expreſſing the principall and greater parts of it. But the *Chorographer* vndertaking the deſcription of ſome ſpeciall and ſmaller part of *England*; as for example, the City of *Oxford*, deſcends much more particularly to matters of ſmall quantity and note: ſuch as are the Churches, Colledges, Halls, Streets, Springs; giuing to each of them their due accidents, colours, lineaments, and proportion, as farre forth as Art can imitate Nature. Neither in this kind of deſcription needs there any conſideration of the places adioyning, or the generall draught of the whole Iland. The ſecond difference betweene *Geographie* and

Chorographie aſſigned by *Ptolomie*, conſiſts in this; that *Chorographie* is commonly conuerſant in the accidentall *qualities* of each place, particularly noting vnto vs, which places are barren, fruitfull, ſandy, ſtony, moiſt, dry, hot, cold, plain, or mountainous, and ſuch like proprieties. But *Geographie* leſſe regarding their qualities, inquires rather of the *Quantities, meaſures, diſtances*, which places haue aſwell in regard one of the other, as of the whole Globe of the Earth: aſſigning to each region its true longitude, latitude, clime, parallell, and Meridian. 3^{ly}, *Geographie* and *Chorographie* are ſaid to differ, becauſe *Geographie* ſtands in little need of the Art of Painting, for as much as it is conuerſant the moſt part about the Geometricall lineaments of the Terreſtriall Globe, clayming great affinity with the Art called of the *Greekes*, *Ichnographie*; whoſe office is to expreſſe the figure and proportion of bodies, ſet forth in a plain *ſuperficies*. But contrariwiſe *Corographie* requires, as a help neceſſary, the Art of Painting; foraſmuch as no man can fully and perfectly expreſſe to the eye the true portraict of cities, townes, caſtels, promontories, and ſuch other things, in their true colours, liuelyhood, and proportion; except they bee skilled in the Art of Painting. So that this part is by ſome likened to that Art which the *Greekes* call *Sciographie*, or *Scenographie*. Fourthly, and laſtly, *Geographie* is diſtinguiſhed from *Chorographie*, in that the former conſidering chiefly the quantity, meaſure, figure, ſite, & proportion of places, as well in reſpect *one of the other*, as of the *Heauens*, requires neceſſary helps of the Sciences Mathematicall, chiefly of *Arithmeticke*, *Geometrie*, and *Aſtronomie*, without which a *Geographer* would ſhew himſelfe euery-where lame & impotent, being not able to wade thorough the leaſt part of his profeſſion: whereas a man altogether vnpractiſed in thoſe faculties, might obtaine a competent knowledge in *Chorography*. As we find by experience, ſome altogether ignorant in the Mathematicks; who can, to ſome content of their hearers, *Topographically*, and *Hiſtorically* diſcourſe of Countries, as they haue read of in books, or obſerued in their trauaile. Notwithſtanding all theſe differences aſſigned by *Ptolomie*, I ſee no great reaſon why *Chorography* ſhould not bee referred to *Geography*; as a part to the whole; foraſmuch as the obiects on which hee hath grounded his diſtinction, differ only as a generall and a ſpeciall; which being not oppoſite, but ſubordinate (as the *Logicians* vſe to ſpeake) cannot make two diſtinct Sciences, but are reduced to one and the ſelfe-ſame: at leaſt the differences thus aſſigned, will not be *Eſſentiall* but *Accidentall*. Wherfore my ſcope in this Treatiſe ſhall bee to ioyne them both together in the ſame, ſo far forth as my Art and leiſure ſhall be able, to deſcend to particulars; which being in *Chorographie* almoſt infinite, wil not all ſeeme alike neceſſary in the deſcription of the vniuerſall Globe of the Earth. The name of *Geographie* thus diſtinguiſhed, wee define it to be a *Science* which teacheth the *Meaſure* and *Deſcription* of the whole *Earth*. It is properly tearmed a *Science*, becauſe it propoſeth to it ſelfe no other end but knowledge; whereas thoſe faculties are commonly tearmed *Arts*, which are not contented with a bare knowledge or ſpeculation, but are directed to ſome farther worke or action. But here a doubt ſeemes to ariſe, whether this *Science* be to be eſteemed *Phyſicall*, or *Mathematicall*? Wee anſwer, that in a Science two things are to bee conſidered: firſt, the *matter* or obiect whereabout it is conuerſant; ſecondly, the *manner* of handling and explication: For the former, no doubt can bee made, but that the obiect in *Geographie* is for the moſt part *Phyſicall*, conſiſting of the parts whereof the Spheare is compoſed: but for the manner of Explication, it is not *pure*, but *mixt*; as in the former part *Mathematicall*, in the ſecond rather *Hiſtoricall*; whence the whole Science may be alike tearmed *Mathematicall* & *Hiſtoricall*; not in reſpect of the *Subiect* which we haue ſaid to be *Phyſicall*, but in the manner of *Explication*. For the obiect of *Geographie* (as we haue intimated) is the whole Globe of the Earth: where we are to obſerue, that the Earth may bee conſidered 3 manner of wayes: Firſt, as it is an *Element*, out of which mixt Bodies are in part compounded: In which ſenſe it appertaines to *Naturall Philoſophie*, whoſe office is to treat of all naturall bodies, their principles and proprieties. Secondly, as it is ſuppoſed to be the center of heauenly motions, and ſo it is vndertaken by *Aſtronomers*. Thirdly according to its Sphæricall *ſuperficies*, as it is propoſed to bee meaſured or deſcribed, in which manner it is the ſubiect of *Geographie*, ſo far forth as the parts of it haue a diuerſe ſituation, as well in regard one of another, as in reſpect of the Heauens. Which reſtriction, although agreeing well to ſome part of it, will hardly ſquare with all the reſt: becauſe many things herein are handled beſides the Earths naturall ſite or poſition, as hereafter ſhall be taught. For which cauſe wee haue rather defined the ſubiect of *Geopraphie* to bee the *Earth*, ſo far as it is to bee meaſured and deſcribed, as wanting one word to expreſſe the whole manner of conſideration.

2 Geographie conſiſts of 2 parts, the Sphericall, and Topicall: The Sphericall part is that which teacheth the naturall conſtitution of the Terreſtriall Spheare.

The common and receiued diuiſion of this *Science* amongſt *Geographers*, is into the *Generall* or vniuerſall part; and the *ſpeciall*. Which diuiſion, I dare not vtterly reiect; being ſtrengthened with the authority of ancient and approued Authors. Yet ſeems it more aptly to be applyed to the *Hiſtoricall* part, then to the whole Science, as we ſhall after make apparant. In the mean time the diuiſion of it into Sphericall & Topicall parts, ſeemes to be preferred in reaſon: Foraſmuch as the *Terreſtriall Globe*, which we ſuppoſe to be the ſubject of the Science, is propoſed to vs vnder a twofold conſideration; firſt in regard of the *Mathematicall* lineaments and circles, whereof the Spheare is imagined to conſiſt; out of which wee collect the figure, quantity, ſite, and due proportion of the Earth, and its parts: Secondly, of the places *Hiſtorically* noted and deſigned out vnto vs, by certaine names, markes, and characters. The former receiueth greateſt light from *Aſtronomie*, whence ſome haue called it the Aſtronomicall part: The later from *Philoſophie* and *Hiſtoricall* obſeruation, being (as we haue ſaid) a mixt Science, taking part of diuers faculties.

3 The Terreſtriall Spheare is a globous or round Body, comprehended within the *ſuperficies* of the Earth and Watet.

Some haue nicely diſtinguiſhed betwixt a *Spheare* & an *Orbe*, that a *Spheare* is a round maſſie body, contained in one ſurface, which is conuexe or outward as a Bowle. The other concaue, or hollow, in manner of an Egge-ſhell emptyed. But this diſtinction ſeemes too curious, as ſauouring too much of Scholaſticall ſubtility, becauſe the name of *Orbe* and *Spheare* are many times promiſcuouſly vſed, without difference, amongſt good Writers. This *Spheare* which wee make the ſubject of our Science, wee call *Terreſtriall*, not becauſe it conſiſts meerely of Earth; (the contrary of which wee ſhall hereafter ſhew:) but becauſe the Earth is the chiefeſt in the compoſition; whence by a tropicall kind of ſpeech, the whole *Globe* may bee called *Terreſtriall*.

4 The handling of the Terreſtriall Spheare is is either *Primary*, or *Secundary*. The Primary conſiſts in ſuch affections as primarily agree to the Earth.

The *Geographicall Affection* may be conſidered two wayes; either *ſimply* and abſolutely in themſelues; or *comparatiuely* as they are conferred and compared the one with the other. As for example, the circles of the *Spheare*, ſuch as are the *Parallels* and *Meridians*, may be conſidered either abſolutely in themſelues; or comparatiuely as they concurre to the *longitude, latitnde, diſtance*, or ſuch like accidents, which ariſe out of the compariſon of one Circle with another.

5 The Terreſtriall Spheare primarily conſidered, is either *Naturall*, or *Artificiall*. The Naturall is the true Globe in it ſelfe, without image or repreſentation.

6 Herein againe are to be conſidered two things; Firſt, the *Principles* and conſtitution of the Spheare; Secondly, the *Accidents* and proprieties: The principles whereof the Spheare is compoſed are two; viz: *Matter* and *Forme*.

7 The Matter is the ſubſtance whereof the Spheare is made, viz: Earth, and Water.

My meaning is not in this Treatiſe to handle the nature and propieties of theſe two Elements, *Water*, & *Earth*, farther then may ſeeme neceſſary for the Geographicall conſtitution of the *Terreſtriall Spheare*, leauing the reſt to the Naturall Philoſopher; becauſe it is ſuppoſed that few men vndertake the ſtudy of this Science, without ſome inſight in the other. And to ſpeake truth, this begins where the Naturall Philoſopher ends. Yet becauſe ſome light in each learning is neceſſarily required, and all men are not willing to ſeeke farther into the grounds of *Naturall Philoſophie*; it will not ſeeme altogether impertinent, to lay the foundation farther off, that the building thereon erected may ſtand ſurer and ſtronger. Wherefore taking ſome beginning from the matter of the Earthly Globe, wee haue diſtinguiſhed it into *Earth*, and *Water*, as thoſe parts whereof the whole Globe is not eſſentially compounded, as one intire body in it ſelfe; but rather coaceruated and compacted together, each part retaining its owne nature and proprieties, without any proper mixture. To expreſſe more fully the conſtitution of this Spheare, we are here to diſtinguiſh betwixt the *firſt* and *ſecond matter*. The firſt matter was that vniuerſall *chaos*, or maſſe, out of which, all bodies both Celeſtiall and Elementary were made and formed, as wee read in the firſt of *Geneſis*. Which whether it be the ſame with *Ariſtotle's Materia prima*, as ſome haue imagined, I leaue to others to diſpute. The ſecond matter of the Globe is either *Proper* or *Accidentall*. The proper we call that whereof the Globe of the Earth moſt properly conſiſts, ſuch as are the two Elements of *Earth* and *Water*. The Accidentall matter is vnderſtood of all other bodies, contained in the *ſuperficies* of the ſaid Spheare, as *Stones*, *Mettals*, *Minerals*, and ſuch like materials, made of a Terreſtriall ſubſtance, and engendred in the wombe of the Earth. Concerning the *Earth* and *Water*, which we make the moſt proper and eſſentiall parts of the Spheare, we will ſet downe theſe two Theoremes.

1 *In the Terreſtriall Spheare is more Earth then Water.*

The Theoreme may bee proued by ſundry reaſons drawne from *Nature* and *Experience*. Whereof the firſt may bee taken from the depth of the waters, compared with the whole thicknes of the Earth. For the ordinary depth of the Sea is ſeldome found to be aboue 2 or 3 miles, and in few places 10 furlongs, which make a mile and a quarter. And albeit ſome late Writers haue imagined the obſeruation to be vnderſtood only of *ſtraight* and *narrow Seas*, and not of the maine Ocean: yet granting it to amount to 10, 20, or 30 miles, it cannot reach to ſo great a quantity, as to come neere the greatnes of the Earth. For the whole circle of the Terreſtriall Spheare being 21600 Engliſh miles, (allowing 60 Engliſh miles to a degree of a greater circle) wee ſhall find the Diameter to bee about 7200 miles: Whoſe ſemi-diameter, meaſuring the diſtance betweene the center and the *ſuperficies* of the Earth, will be 3600 miles. And if any man ſuppoſe ſome of the quantity to be abated, becauſe of the Sphericall ſwelling of the Water aboue the Earth, whoſe Circle muſt be greater than that of the Earth: We anſwer; firſt that this may challenge ſome abatement, but not come neere any equality of the *Water* with the *Earth*. Secondly it is to bee imagined that the ſurface of the Sea, howſoeuer as it is painted in Globes and Charts, it ſeeme for a great part empty and vnfurniſhed of Ilands; yet this for the greateſt part, ſeeme rather to bee aſcribed to mans ignorance, and want of true diſcouery, becauſe many quillets and parcels of land lye yet vnknowne to our Chriſtian World, and therefore omitted, and not figured in our ordinary Mappes. So wee find a great quantity of Earth which lay hid and vnknowne without diſcouery, in the dayes of *Ptolomy*, which cauſed him to contract & curtaile the Earth in his *Geographicall* deſcriptions. Which defect hath been ſince that time ſupplyed by the induſtrious trauailes and Nauigations of later time: ſuch as were of *Portugals*, *Engliſh*, and *Hollanders*, eſpecially of *Columbus* the *Italian*, who (as one wittily alluding to his name) like *Noah's* Doue plucking an oliue branch from this Land, gaue teſtimony of a portion of Land as yet vnknowne, and left naked vnto diſcouery. And no queſtion can be made, but a great quantity of land, not yet detected by our *European* Nauigators, awaites the induſtry of this age. To which alludes the Poët in theſe Verſes:

Seneca in Medeâ. Act. 2.

Venient annis ſecula ſeris,
Quibus Oceanus vincula rerum
Laxet, & ingens pateat tellus,
Typhiſq; nouos detegat orbes,
Nec ſit terris vltima Thule.

In after-yeeres ſhall Ages come,
When th'Oecean ſhall vnlooſe the bands
Of things, and ſhew vaſt ample lands;
New Worlds by Sea-men ſhall be found,
Nor *Thule* be the vtmoſt bound.

Another reaſon to proue the Earth to be greater in quantity, may bee drawne from the mixture of *Earth* and *Water*: for if theſe two Elements ſhould meet in the ſame quantity, & challenge an equality; queſtionleſſe the whole Earth would proue ouer-moiſt, ſlymie, and vnapt for habitation. Which any man may eaſily obſerue by his owne experience. For let a portion of Earth, & another of Water be mixt together in the ſame quantity, the whole maſſe will ſeeme no other than a heap of mire or ſlime, without any ſolid or conſiſting ſubſtance. Moreouer the *Water* being no other than a thin and fluid body, hardly containing it ſelfe within its own bounds or limits (as *Ariſtotle* tea-

De gen. & cor.

cheth vs) muſt needs require a hard and ſolid body, whereon to ſupport it ſelfe, which body muſt of neceſſity bee greater in quantity.

2 *The* Earth *and* Water *together make one Spheare.*

It may bee probably collected from ſundry places of holy *Scripture*, that in the firſt Creation, the ſurface of the Earth; being round and vniforme, was ouerwhelmed and compaſſed round with Waters, as yet vnfurniſhed of liuing Creatures. Secondly, it appeares that *Almighty GOD* afterwards made a ſeparation betwixt the *Waters* and *Dry-Land*. This ſeparation (as farre as reaſon may bee admitted as Iudge) ſeemes to bee effected one of theſe two wayes: Either by giuing ſuper-naturall bounds and limits vnto the Waters, not ſuffering them to inuade the *Dry-land*: or els by altering the *ſuperficies* of the Earth, caſting it into inequall parts, ſo that ſome-where, ſome parts of it being taken away, empty channels or concauities might be left to receiue the Waters; other-where by heaping vp the parts ſo taken away, whence were cauſed *Mountaines* and eminent places on the earth. The former of theſe wayes ſeemes altogether improbable; foraſmuch as it is very vnlikely to imagine, that God in the firſt inſtitution of Nature, ſhould impoſe a perpetuall violence vpon Nature, as hereafter in place more conuenient ſhall bee demonſtrated. Wherefore taking the later as more conſonant to reaſon; we ſhall find that the Water & the Earth ſeparated and diuided, make not two ſeparate and diſtinct in Globes, but one and the ſame Spheare; foraſmuch as the concauities and hollowgapings of the Earth, are euery-where choaked and filled vp with Water, whoſe *ſuperficies* is Sphæricall; and therefore helpes, together with the Earth, to accompliſh & perfect this *Terreſtriall Spheare*. To confirme which opinion, theſe reaſons out of common experience may be alleadged: The firſt is drawn from the parts of Earth and Water; For we may euery-where obſerue, that a portion of Earth, and another of Water being let fall, will deſcend in the ſame right line toward the ſame center: whence we may euidently conclude, that the

Eearth & Water haue one and the ſelfe-ſame center of their motion', and by a conſequence conſpire to the compoſition of one and the ſelfe-ſame *Spheare*. Secondly, to a like Arch or ſpace in the Heauens, is found anſwerable a like Arch in the *Terreſtriall Globe*, whether it bee meaſured by the Earth or Water: which could not happen, were they not accounted parts of the ſame *Spheare*. The third reaſon may bee drawne from the *Ecclipſe* of the Moone, wherein the part of the Moone ſhadowed & obſcured, is obſerued to be one Sphæricall or round figure. This shadow, by the conſent of all *Aſtronomer's* is cauſed by the *Terreſtriall Spheare*, interpoſed betwixt the Sun and the Moone, intercepting the Sun-beames, which ſhould illuminate the Moone; and the ſhadowes imitate the opacous bodies, whence they ariſe: But in the *Ecclipſe* we find only the ſhadow of one body or *Spheare*, and therefore according to the ground of the *Opticks*, we may conclude the body whereof ſuch a ſhadow proceedeth, to be but one and the ſelfe-ſame *Spheare*.

8 The *Forme* of the Terreſtriall Spheare, is the naturall Harmony or order, ariſing from the parts working together.

We ought here to remember what we ſaid before; that the Earth and the Water concurre together to make one *Terreſtriall Spheare*: wherefore the whole being accounted one coaceruated and collected *Body*, made of two other; we are not to expect an *Internall*, *Eſſentiall*, and *Specificall* Forme, ſuch as *Ariſtotle* recounts amongſt the principles of a Naturall Body: but only ſuch a one as in it ſelfe is *Externall* and *Accidentall*; yet concurring (as it were) Eſſentially to the conſtitution of the *Terreſtriall Spheare*, whoſe Fabricke and firſt compoſition, cannot well be vnderſtood without it. Some haue imagined the whole Globe of the Earth to bee informed with one Internall and Eſſentiall Forme; which opinion ſeemes to haue much affinity with that of *Plato's*, concerning the *Soule* of the World: Not that *Plato* and his followers were ſo abſurd to defend, that the World with all his parts was animated with a true vitall Soule, in the nature of a liuing Creature: but that all the members of it were vnited together, quickned, and diſpoſed by a certaine *Energeticall* power or vertue, which had great reſemblance and repreſentation of the Soule of man. Which aſſertion ſeemes to be reſtored and embraced by our late *Magneticall Philoſophers*, whoſe opinion we ſhall diſcuſſe and examine hereafter in place conuenient. In the meane time, grounding our diſcourſe on knowne principles; we can admit no other *Forme* in the *Spheare* of the Earth, then the mutuall *Harmony*, order and concent of the parts, concurring together, and working the perfection & perpetuation of the whole. A fit reſemblance whereof we may obſerue in an artificiall Clock, Mill, or ſuch like great Engine, wherein euery part duly performing its owne office, there will ariſe and reſult a naturall Harmony, whch not vnaptly may bee termed the Forme of the whole Engine. Why the World ſhould not conſiſt of an Internall and Eſſentiall Forme, ſundry reaſons haue been alleadged by our common *Philoſophers*: Firſt, becauſe Nature neuer attempteth any thing in vaine, or without a determinate end; But the particular Formes of ſpeciall Bodies (ſay theſe *Philoſophers*) are ſufficient for the vnity and conformation of this *Terreſtriall Globe*: ſo that to grant an vniuerſall Forme of the whole, were to multiply cauſes without any neceſſity, & make Nature the Mother of ſuperfluity, which to all *Philoſophers* ſeemes moſt abſurd. Secondly, if this were admitted; the whole *Spheare* of the Earth would bee as one continuate Body, whoſe parts ſhould (as it were) ſuffer a fellow-feeling one of the other. Thirdly, it were a difficult matter to aſſigne, to what kind ſuch a Forme might be reduced, whether *Animate*, or *Inanimate*. If Inanimate, whether it were *ſimple*, or *compound*. If Animate, whether *Vegetatiue*, *Senſitiue*, or *Rationall*; vnder the which are couched many great difficulties, as yet vndiſcloſed. Whether theſe reaſons bee of any great force to ouerthrow the aduerſe opinion, I leaue it to further inquiry: intending here a *Geographicall*, not a *Phyſicall* Diſcourſe.

CHAP. II.

Of the conformity of parts in the conſtitution of the Terreſtriall Spheare.

1 IN the former we haue treated of the *Naturall conſtitution* of the Terreſtriall Spheare, aſwell in *Matter* as *Forme*: It is needfull in the next place to treat of ſuch *Affections* and proprieties as neceſſarily ariſe out of ſuch a Conſtitution.

2 Thoſe *Affections* or Proprieties are of two ſorts, *Reall* or *Imaginarie*; Reall I call ſuch as agree to the Terreſtriall Globe by Nature: Imaginary, ſuch as agree to it by vertue of our vnderſtanding.

3 Againe the Affections *Really* or Naturally agreeing to the Terrene Spheare, are aſſigned either in reſpect of the *Earth* it ſelfe, or in reſpect of the *Heauens*.

4 Theſe Affections are ſaid to agree to the *Earth* in reſpect of it ſelfe, which may be expreſſed and vnderſtood without any comparing of it with the celeſtiall Bodies.

5 Theſe againe are twofold; either *Elementarie*, or *Magneticall*. Elementary I terme

ſuch as haue commonly been knowne or obſerued by ordinary Philoſophers. Here is chiefly to bee conſidered the conformity of the Terreſtriall parts, in the making and conſtitution of the whole Spheare.

In the former Chapter we haue ſhewed, that the Forme of the *Terreſtriall Spheare*, is nothing els but the concinnity and apt conſpiration of the parts whereof the whole is compounded. This conformity being diuers and manifold, as well in regard of the parts conforming themſelues, as the manner; of the conformity, we ſhall particularly and diſtinctly treat of, ſo far as appertaines to a *Coſmographer*. Here by the way I cannot but taxe ſome defect in moſt of our common *Coſmographers*, who taking the *Sphæricall* roundnes of the Earth for a granted ſuppoſition, are nothing curious to ſearch into the firſt grounds and cauſes of this rotundity, whereby it firſt became a globous Body; and afterwards retaines in it ſelfe a Naturall vigour or power (if any violence ſhould be offered) to reſtore her ſelfe to her former right and perfection. All which are very pleaſant & profitable, to giue an induſtrious Learner ſome ſatisfaction. To explaine this before we deſcend to particulars, we will lay this ground and Theoreme;

1 *The parts of the Terreſtriall Spheare, doe naturally conforme and diſpoſe themſelues, aſwell to the production and* generation, *as to the continuance and* preſeruation *of it.*

The forme of the *Terreſtriall* Spheare, albeit (as wee haue ſhewed) it be *Externall* in reſpect of the whole Globe: yet may we call it *naturall*; foraſmuch as it iſſueth and ariſeth from the naturall diſpoſition and inclination of all the parts. To vnderſtand which clauſe the better, wee are to conſider that a thing may bee called *Naturall* two manner of wayes: firſt in regard of the *primary* intent of Nature; as the neereſt and immediate end or ſcope to which ſhee is directed. Secondly, in reſpect of her *ſecundary* intent or purpoſe, as that which muſt of neceſſity follow the former. True it is that euery Terrene Body, according to Natures *firſt* intention, ſeeks and works it's owne perfection and conſeruation. Neuertheleſſe according to her *ſecundary* Intent, it concurres to the perfection and good of the whole vniuerſe; which we ſhall plainely ſee in a ſtone or clodd of earth; which ſeparated and remoued from it's mother, the Spheare of the Earth, by his deſcent and falling downewards, ſeeks firſt his owne conſeruation, by reuniting it ſelfe to the Earth whence it was taken: Secondly, of the whole Globe of the Earth, which by this vnion and addition, no doubt, is made more compleat and perfect. This conformity of the Terreſtriall parts, out of which ariſeth the Earths *Sphæricity*; I call the naturall inclination they haue to moue and ſettle themſelues in ſuch a ſite or poſition, as may bring forth a *Sphæricall* conſiſtency: ſo that if it were poſſible (as what cannot be to Gods Almighty power?) that the whole Globe of the earth were diſſolued and rent into little peeces; yet were that vigor and motiue inclination remaining in the parts, whereby they might ſettle and conforme themſelues to the ſame *Sphæricall* nature, and compoſition which it formerly enioyed. For all the parts thus ſuppoſed to be diſtracted, would (no queſtion) meet together & conforme themſelues to the ſame point or Center; and ſo equally poiſing themſelues, would reſtore the ſame Spheare ſo diſſolued. So that wee here note a double inclination and motion of earthly bodies; firſt by a *Right line*, of the parts tending towards the Center; the other *Sphericall* of the whole *Spheare*, whereof the firſt in nature preceedes the compoſition of the Spheare, the other followes. But this latter motion I leaue doubtfull, till place conuenient.

6 The conformity of the Terrene parts is twofold; *Primarie*, or *Secondary*. The former is that whereby all earthly bodies are by a right line carried and directed to the Center

of

of the Terreſtriall Globe.

As in an *Artificiall* Spheare or circle, drawne by a Geometrician, their principall parts are expreſſed, to wit, the Center, Ray, and circumference: ſo in the *Naturall* Globe of the Earth, theſe three, as it were Naturally & Really diſcouer themſelues vnto vs. For firſt there is ſet a fixt point, to which all heauy bodies moue and conforme themſelues. Secondly, there is ſet the line or *Radius*, in which ſuch bodies are carryed and conueyed. Thirdly, the confluence of all theſe parts, begets the *roundneſſe* and Sphæricall forme. To begin firſt with that which is firſt in nature, we will take theſe grounds.

1 *All Earthly Bodies incline and approach to the Center as neere as they can.*

This propoſition ſo farre forth as it concernes the two Elements of *Earth* and *Water*, is confirmed by common experience, and therefore needs no long demonſtration. For we ſee plainly, that not only theſe two doe incline (as much as may be, all obſtacles being remoued) to the Center of the Earth; but alſo all mixt bodies compounded of them, being ouerſwayed with the moſt predominant element, doe challenge to thẽſelues the ſame motion. I ſay not that all theſe Terreſtriall bodies driue & meet in the Center (for that were impoſſible, that all this maſſy Spheare ſhould bee contracted to one point) but that all the parts haue a mutuall inclination to approach as neere the Center, as the neceſſity of the place, and the concurrence of them amongſt themſelues will ſuffer. By theſe Terreſtriall Bodies which inioye this motion and inclination, wee vnderſtand firſt the two Elements of *Earth* and *Water*, with all other bodies ariſing out of their mixture. To theſe I may adde the *Ayre*, which by reaſon of his affinity with the Earth and Water, and naturall cõformity to the ſame Center, we may well tearme an earthly body. It is commonly reported that the Ayre is *light*, and therefore carried vpwards, not inclining at all to the Center of the Terreſtriall Globe; as the parts of theſe two Elements are. But this aſſertion, although bolſtred vp, both with antiquity and authority; I take either to bee falſe, or miſunderſtood, and that I ſpeake no more herein than I can proue; I will produce ſome reaſons (ſtrong enough, as I thinke) to perſwade that the Ayre is a heauy body, hauing a due inclination and conformity to the Center of the Earth: Firſt therefore will I produce this experiment. When a Well or deepe Trench is digged vp in the earth, I would willingly demand whether the Aire deſcends to fill up this Trench or concauity; or elſe a void ſpace is left vnfurniſhed of any naturall body to fill it? If they admit the latter, they will conſequently bring in againe that *vacuum*, or void ſpace which *Ariſt.* and all ſound Philoſophers haue long ſince proſcribed the confines of nature. If they affirme the former, that the Ayre deſcends to fill vp this empty ſpace, I wil aske againe, whether this deſcent of the Ayre be violent or naturall: If they ſay Naturall, they admit our aſſertion, that the Ayre naturally deſcends towards the Center, and ſo by conſequence that it is heauy and not light by nature. Neither according to our *Peripateticall* Philoſophy can wee aſcribe more than one motion to the Aire, becauſe it is a ground generally receaued among *Ariſtoteleans*: that One ſimple body can claime but one ſimple motion: much leſſe one ſimple forme, as that of the Aire, can produce two oppoſite and contrary motions, ſuch as are Aſcent and Deſcent of the ſame body. If they chance to light on the other member of our diſtinction, and ſay that the motion of the Aire in this ſort is violent, it muſt needs follow, that it muſt haue ſome externall cauſe or principle whence it ſhould proceed; becauſe all ſuch motions proceed from externall cauſes. But here no ſuch cauſe can be aſſigned: For the cauſe would bee either the Earth which is ſo made hollow, or the emptineſſe, or *vacuum*, or at leaſt the other parts of the Aire. That it is not the Earth, may be proued; firſt becauſe no Philoſopher hath euer ſhewed any ſuch Attractiue power to reſide in the Earth, but rather the contrary; becauſe the Earth and Ayre by moſt haue beene thought oppoſite in nature, and repugnant one to the other. Secondly, becauſe Philoſophy teacheth, that no agent can worke vpon a ſeparate and diſtinct patient, except there be a meeting of the Agent and Patient in ſome meane, But here in this ſuppoſition, the Earth is imagined to drawe and attract the Aire, which as yet it toucheth not. That this externall cauſe is not the *Vacuum* or Emptineſſe, is plaine; becauſe it was neuer granted to haue any being or exiſtence, much leſſe any cauſality in nature. Some perhaps will ſay, that not the *vacuum* it ſelfe, but the euitation and auoiding it, is the cauſe of the motion. I deny not but this may in ſome ſort be interpreted a cauſe, but the doubt is not anſwered: For wee ſeeke not a *Finall* but an *Efficient* cauſe; and a curious ſearcher into Nature, will hardly reſt in a meere finall cauſe. For the finall cauſe, ſo farre forth as it is a cauſe preceding the effect, can no otherwiſe bee conceiued than in the intention of the Agent: then muſt enquiry bee made againe what the Agent ſhould bee, and ſo will the probleme reſt vncleered. 1. Becauſe one parcell of the Aire could not moue another, except the ſame were firſt moued it ſelfe, and ſo a new Agent muſt of neceſſity bee found out. 2 The Agent and the thing moued or Patient, ought to bee two ſeparate and diſtinct bodies: But the parts of the ayre meeting together, become one continuate body. No ſhift is there left for theſe Philoſophers but one diſtinction, wherein they diſtinguiſh betwixt the *Vniuerſall* and *Speciall* forme, The Aire, as they affirme, according to his *Speciall* forme, aſcends vpward from the Center of the *Earth*: yet by the *Vniuerſall*, for the conſeruation of the whole vniuerſe, it may ſometimes ſuffer a contrary motion, as to moue downeward toward the Center. In which diſtinction they ſuppoſe they haue cut the throat of all contrary reaſons. But who ſo vnderſtands himſelfe, ſhall finde it but as a weake reed, to hurt his hand which reſts on it: for a ſecond enquiry will bee made, what this vniuerſall forme ſhould bee. For by it they vnderſtand of neceſſity either an *Internall forme* or Nature; or an *Externall reſultancie* and harmony of the parts, ſuch as wee haue deſcribed in the firſt Chapter of this booke. If they vnderſtand this latter, it cannot any way bee a cauſe of this motion; becauſe it followes and ariſeth out of this motion concurring with the reſt, and no way preceeds it: wheras on the contrary part euery cauſe is to goe before his effect: Secondly, this vniuerſall forme or nature compared with the ſpeciall, there would ariſe a *Subordination*, and not a *Coordina-*

tion, or oppoſition; foraſmuch as the ſpeciall is ſubordinate to the generall or vniuerſall. But ſubordinate cauſes can produce no other than ſubordinate effects. But here we ſee the effects or motions to bee quite oppoſite the one to the other; in aſmuch as the motion of Deſcent in the Aire (which they aſcribe to the vniuerſall forme) is cleane oppoſite to the motion of Aſcent, aſcribed to the ſpeciall nature. Thirdly, theſe *Philoſophers* vrging the neceſſity of Nature to preſerue the Vniuerſe, are much deceaued in the manner and meanes thereof. True it is that all Earthly and heauy bodies are directed and diſpoſed to the conſeruation of the earthly Globe. But euery ſuch body (as wee haue ſhewed before) ſeekes firſt the ſafeguard and preſeruation of it ſelfe, and ſecondarily by the ſafeguard of it ſelfe the preſeruation of the whole. For how can any part, when it neglects its owne ſafety, endeauour the preſeruation of the whole: ſith the whole is but one compounded of many parts. And therefore can it not bee auoided, but that the diſorders and diſharmony of one part, ſhould preiudice and deſtroy the whole frame. If they turne to the other part, and grant this vniuerſall forme to bee *Internall*, many reaſons ſtand oppoſite. For firſt I would demand, whether this vniuerſall forme bee *ſimple* or *compounded.* It cannot bee ſimple, becauſe it would alwayes produce one ſimple and vniforme effect: but experience hath taught the contrary; becauſe wee ſhall not alwayes find the aire to deſcend, but ſometimes to moue obliquely to the left or right hand, backward and forward; as when it enters into the houſe by a doore or windowe. On the other ſide, it cannot well be called a compound forme; becauſe all formes the more vniuerſall they are, the more ſimple they are to be accounted: becauſe the ſpeciall includes more compoſition than the generall. Moreouer, all compounded ſubſtance ariſe out of ſimples, which are to bee eſteemed firſt in nature. Secondly, I would aske whether this vniuerſall forme bee *vna numero*, the ſelfe ſame indiuiduall in all the parts and bodies; or diuerſe, according to the diuerſity of the ſaid Bodies. It cannot bee one and the ſelfe ſame in all bodies, becauſe, according to the opinion of *Ariſtotle*, the whole vniuerſe is not one continuate body compoſed of eſſentiall parts;

but rather a heape or maſſe collected and digeſted out of many bodies. Secondly, the forme being thus one indiuiduall, would bee ſingular or ſpeciall, not vniuerſall. If they affirme that this forme is diuerſe according to the diuerſity of the bodies, it cannot bee the cauſe of this motion or deſcent in the Aire. For this motion (as they ſuppoſe) is deſtined and appointed to no other end, than to comfort Nature in her diſtreſſe, when ſhee ſtands in feare of rupture or diſſolution. But how can this forme being bounded within the limits of the Aeriall *ſuperficies* perceaue or feele this exigence of Nature in other Bodies? Whatſoeuer they can ſay in this, is altogether vncertaine, and not warranted by any ſound demonſtration. A ſecond reaſon for the naturall deſcent of the Aire, may bee drawne from a poſſible ſuppoſition; from which wee may enforce a true concluſion. Let vs ſuppoſe a portion of Aire by ſome violence to bee carried aboue his proper orbe; as for example, to the ſpace which by our common Philoſophers is aſcribed to the Element of Fire, neere the concaue *ſuperficies* of the Moone, I would here demand whether this portion of Aire thus tranſpoſed would aſcend higher, or deſcend lower, or reſt ſtill in the ſame place? It could not aſcend higher; firſt becauſe in this wiſe it ſhould be moued farther out of his owne place, whereas according to the principles of Philoſophie, all bodies tranſpoſed from their proper places, haue an aptneſſe or inclination to returne againe to their proper ſeats, and not to roue farther off. Secondly, this granted, the Aire ſhould inuade the place of the fire and ſo the Elements ſhould ſuffer a confuſion; which *Ariſtotle* holds abſurd. Thirdly, there cannot be imagined in that higher orbe any point or center, to which it ſhould direct his motion; and therefore there is no ſuch motion found; or it muſt bee very irregular. If on the other ſide it were granted, that ſuch a portion of Aire ſo ſeparated, ſhould deſcend; I aske againe, whether they hold this motion ***naturall*** or ***violent***: It cannot bee a violent motion, becauſe it is directed to his owne naturall and proper place; and this motion in the Elements, is alwayes accounted naturall. Laſt of all, it cannot reſt ſtill in the ſame place, becauſe all bodies forced out of their places (all obſtacles being remoued) muſt needs returne vnto their proper place. Wherefore no other ſtarting hole is here left to our oppoſites, but that they grant a naturall motion, and ſo conſequently yeeld to our aſſertion. A third reaſon may here bee drawne from the condenſation of the Aire. It is a receiued opinion amongſt moſt Philoſophers, that the thinne and ſubtile parts of the Aire will naturally mount vpward; but the thicker and condenſated parts, pitch and ſettle themſelues downeward: Which obſeruation, if it bee true, will yeeld vs this concluſion. That the Aire is by nature heauy, and therefore moueth downeward, toward the center of the Sphericall Globe of the Earth. Which I will demonſtrate out of theſe Principles, 1 That that body, which by addition of parts or condenſation, is made more heauy or ponderous, muſt needs haue ſome weight in it ſelfe. This may eaſily appeare, becauſe the mixture of lightneſſe with heauineſſe will not intend and encreaſe the ponderoſity, but ſlacke and diminiſh it. For the chiefeſt thing which remits or diminiſheth any quality, is the mixture of his contrary, as wee ſee the quality of cold to be abated and weakened if it entertaine any mixture of heat: 2 The thickning or condenſation of any body is made by addition and coaction of more parts into the ſame ſpace or compaſſe. As if the Aire or any ſuch like body were thickned, it would confine it ſelfe to a more narrow roome then before, and ſo conſequenly the narrow roome would containe more parts then before. Out of which wee conclude, that foraſmuch as many parts preſſed together in the ſame ſpace, make the whole maſſe more ponderous; theſe parts ſo preſſed together, muſt needes haue ſome waight in themſelues. Which may further be illuſtrated; becauſe the intention of the quality commonly followes the condenſation of the ſubiect: Which may eaſily appeare in red-hot-iron, which burnes and ſcorcheth more than flame or coales; becauſe euery part hath more degrees of heat. Now where more parts are cloſely preſſed together, the heat muſt needs bee more feruent. I haue dwelt longer on this ſubiect, becauſe I would not ſeeme to broach a new opinion without ſufficient reaſon. To conclude all, and come as neere the receiued opinion as I can; I will ſay, that the Aire may bee conſidered

dered two wayes; firſt *abſolutely* in it ſelfe; ſecondly in *compariſon* of heauier bodies, to wit, the *Earth* and *Water*. In the firſt ſenſe I grant no abſolute lightneſſe in the Aire; becauſe out of his naturall inclination, it tends as neere as it can to the center, as all other lower bodies. But if we conſider it comparatiuely in reſpect of other heauier bodies, we may call it light, that is, leſſe heauy or ponderous. So that by *lightneſſe* we vnderſtand no *abſolute* lightneſſe, but a *priuation*. The ſumme of all wee haue hitherto proued, is this; That all terrene bodies, as Earth, Water, Aire, and other mixt bodies which concurre to the compoſition of the Earthly Spheare, as neere as they can, ſettle and conforme themſelues to the center of the Earth; which ſite or poſition of them to the center, is their true and naturall place, wherein they ſeeke their preſeruation.

2 *Of two heauy Bodies ſtriuing for the ſame place, that alwaies preuaileth which is heauieſt.*

3 *Hence it comes to paſſe that the* Earth *enioyes the loweſt place, the next the* Water, *and the laſt the* Aire.

The increment or increaſe of any effect, muſt neceſſarily ariſe from the greater vigour or efficacy of the efficient cauſe, as both Reaſon and Philoſophie well teach. Now (as wee haue ſhewed) all heauy bodyes naturally do deſcend downeward, out of a naturall inclination they haue to attaine the center: but where there is a greater weight or conſtipation of ponderous parts in the ſame maſſe, there muſt needs proceede a greater inclination: Suppoſing then the *Earth*, *Water*, and *Aire*, being three waighty bodies to incline and diſpoſe themſelues to their vttermoſt force to incloſe and engirt the center of the Terreſtriall Spheare; it muſt needes bee that the *Earth* beeing the moſt compact and ponderous, muſt obtaine the preheminence; next to which ſucceedes the *Water*, then the *Aire*, being of all other the leaſt ponderous. Yet wee deny not but the Water and Aire being ſetled in this wiſe, are in their naturall places; which to vnderſtand, wee muſt repeate what we ſaid before, that Nature hath a twofold *intention*; the one *primary*, the other *ſecondary*. Indeed if we conſider Natures primary or ſpeciall inclination in the bodies themſelues, we ſhall finde them (as wee ſaid) immediatly directed to the center as neere as might bee: but the ſecondary intent of Nature was, that the bodies ſhould ſo ſettle and conforme themſelues, as that each of them ſhould obtaine a place according to his degree of maſſineſſe and waight. Out of this may bee anſwered a certaine obiection which ſome haue produced, to proue the Aire to bee abſolutely light in his owne nature. Experience teacheth vs (ſay theſe men) that a bladder blowne vp with winde, or an empty barrell being by force kept vnder water; the force and obſtacle omitted, will ſuddenly aſcend to the top; and that a man ready to ſinke in the Water, will not ſo eaſily ſinke downe while hee can hold his breath: all which effects they aſcribe to no other cauſe, than to inclination of the Aire to moue vpwards from the center. But indeed this motion, howbeit agreeable to the vniuerſall nature and conſiſtency of the Spheare, is notwithſtanding in reſpect of the Aire it ſelfe, vnnaturall and violent; becauſe this aſcent of it is not cauſed by the forme of the Aire, but the interpoſition of a heauier body ſtriuing for the ſame place, and ſo reuerberating it backe from the place, whereunto it tended. For here is to bee imagined, that the bladder or empty barrell drowned in the water, claimes and inioyes for the time that place or diſtance, which otherwiſe ſo much water ſhould occupie; to wit, ſo many inches of feete from one ſide to the other. No maruell then that obſtacles remoued, the Water being moſt ponderous and waighty, receiues his owne right; and (as it were) ſhoulders out the Aire, and violently driues it off to his owne habitation. Whence many haue imagined that this motion is proper and naturall to the Aire, when of it ſelfe it is meerely violent, and enforced by the interiection of another body more waighty and ponderous than it ſelfe.

7 this conformity of the Terreſtriall parts, two things are to bee obſerued: 1 The *center* it ſelfe: 2 The *parts* which conforme themſelues vnto it. The Center is an imaginary point in the midſt of the Terreſtriall Globe, to which all the parts are conformed.

The Fathers of the *Mathematicall* Sciences, haue laboured to deriue all their doctrine from a point, as the firſt and moſt ſimple principle whereon all the reſt depend. Not that they imagine a point to bee any poſitiue *entity* in it ſelfe; but becauſe it is the firſt bound of magnitude, whence all terminated quantities take their originall. The firſt principle wee may call it, not of naturall conſtitution, becauſe a thouſand points collected, could not be ſo compounded, as out of it ſhould ariſe the leaſt magnitude; for (as the Philoſopher hath taught vs) continuate and diuiſible things cannot bee made out of ſuch things as are meerely diſcontinuate and indiuiſible, but becauſe it is the firſt Mathematicall principle or beginning of termination and figuration. This point, although it haue euery-where an vſe in *Geometrie*, yet no-where more remarkeable then when it becomes the center of a circle: which center wee ought not to imagine a meere *Geometricall* conceit, but ſuch as findes ground in the *Naturall* conſtitution of the *Terreſtriall Spheare*. For ſeeing all terrene bodies are carried in a right line as by a *Radius* to one point, from euery part of the circumference; we may obſerue a center as it were deſigned and pointed out by Nature it ſelfe in the Globe: Some haue here diſtinguiſhed betwixt a point *Phyſicall*, and a point *Mathematicall*, as allotting the former *Latitude*, and ſenſible exiſtence; but making the other meerely *Indiuiſible*. But if the matter bee rightly vnderſtood, they are not two points, but all one, diſtinguiſhed only by a diuers name of conceit or conſideration. For wee conſider firſt a point as it is exiſtent in a ſenſible particular body, and ſo we call it *Phyſicall*. Secondly wee abſtract it from this or that body ſenſible; but alwayes conceit it withall to bee in ſome body, and in this ſort wee terme it *Mathematicall*: for the Mathematician abſtracts not a *Quantity* or *Quantitatiue* ſigne from all ſubiects; for ſo being an accident, hee ſhould conceiue it abſtracted from its owne nature; but from this or that ſenſible body, as wood or ſtone. Such a point ought we to imagine the center of the Earth to be, not participating of any latitude or magnitude, albeit exiſtent in ſome magnitude. I am not ignorant that ſome Writers haue taken a *Phyſicall* point for a ſmall and inſenſible magnitude, in which ſenſe the Globe of the Earth is called the center of all heauenly motions. But this ſenſe is very improper; and beſides in this example is to bee vnderſtood a point *Opticall*, as ſuch as carries no ſenſible or proportionable quantity in regard of the ſight. Taking then the center of the Earth to bee a point fixt in the middeſt of the Earthly Spheare, as we haue deſcribed, wee will further deſcribe the nature of it in two Theoremes.

1 *The center of the Earth is not an* Attractiue, *but a meere* Reſpectiue *point.*

An *Attractiue* point I terme that, which hath in it a vertue or power to draw and attract the Terreſtriall parts or bodies, in ſuch ſort as the Loadſtone hath a power to draw iron or ſteele. But a *Reſpectiue* point is that, which the Bodies in their motions doe reſpect and conforme themſelues vnto, as the bound or center to which their courſe is directed. Which may bee illuſtrated by the *directiue* operations of the Load-ſtone (which wee ſhall hereafter handle) by which the *Magneticall Indix* or needle pointeth directly Northward: not that in the North is fixed any Attractiue vertue or operation, which might cauſe that effect; but becauſe the Magneticall Inſtrument is directed towards ſuch a point or center. That the Center of the earth hath no Attractiue force, may bee proued, 1 Becauſe it cannot in any probability bee thought that an Imaginary point hauing only a *priuatiue* Being and ſubſiſtence, ſhould challenge to it ſelfe any ſuch operation. For all *poſitiue* effects, proceed out of poſitiue cauſes, neither can it be imagined that this Attraction ſhould grow out of a meere *priuation.* Secondly, ſhould this be granted, that the motion of Earthly parts ſhould be from the Attractiue vertue of the Center; it would follow neceſſarily, that this motion ſhould not bee *Naturall*, but *violent*: as proceeding from an *externall* cauſe, which all ancient and moderne Philoſophers deny.

2 *The ſame point is the center of* Magnitude *and* waight *in the Terreſtriall Spheare.*

That the ſame point in the *Terrene* Globe, ſhould make the center both of *Magnitude* and *Waight*, may ſeeme very plaine: 1 Becauſe we are not to multiply things and Entities in our conceit, without any neceſſary conſequence drawne from Nature or Reaſon; enforcing vs thereunto. But what reaſon could euer perſwade any man, that the Earth had two Centers, the one of *Waight*, the other of *Magnitude*, but only a bare Imagination, without proofe or demonſtration. Secondly, if this were granted, that the Center of magnitude were remoued ſome diſtance from the other; then conſequently would one part of the Earth ouer-poize the other in ponderoſity, and ſo the whole Spheare would either be ſhaken out of its place, or diſſolue it ſelfe into its firſt principles. Both of which being by experience contradicted, our aſſertion will ſtand ſure and vndoubted. In the meane ſpace, we deny not but that ſome little difference may be admitted in regard of the vnequall parts of the Earth; but this muſt needs be ſo ſmall and inſenſible as cannot bee cacullated, or cauſe any alteration.

8 The Terrene parts conforming themſelues to this center, may bee conſidered two wayes: either *Abſolutely*, or *Comparatiuely*. Abſolutely, as euery part is conſidered in it ſelfe.

9 A terreſtriall part conſidered in it ſelfe, vndergoes

dergoes the reſpect either of a *Point* of *Magnitude*; as a point, when any ſigne or point in it ſelfe is conſidered in regard of his conformity to the center.

A *Point*, albeit exiſting ſtill in ſome magnitude (as we haue ſhewed) may notwithſtanding bee abſtracted from this or that body, as ſeruing for the *center* of any body, whoſe naturall inclination and conformity to the vniuerſall center of the Earth, we may in the firſt place handle, as the Rule by which the motion and inclination of the whole magnitude ought to bee ſquared.

1 *Euery point or center of waighty body, is moued toward the center of the Terreſtriall Spheare by a right line.*

A Right line is the meaſure and rule almoſt of all *Naturall* actions: which albeit it be familiar in almoſt euery operation; yet moſt of all in the motion of the Earthly bodies tending to the center of the Earth. Why *Nature* in this kind ſhould chiefly affect a *Right* line, ſundry reaſons may bee alleaged: 1 From the *End* which Nature doth propoſe it ſelfe, which is to produce the worke which ſhee intends, the readieſt and ſhorteſt way; as *Ariſtotle* teſtifies of her in the 5 of his *Metaphiſickes*. Now it is manifeſt that a Right line drawne betwixt the ſame points, is alwayes ſhorteſt, as *Euclide* ſhewes in his *Elements*; where hee demonſtrates that two ſides of any *triangle* being counted together, are longer then the third. The better to vnderſtand the working of *Nature*, wee ſhall obſerue in the motion of a heauy part to the center, a double ſcope or end; firſt, that the ſaid part of a *terreſtriall* body, ſhould bee moued or ſeparated from the place to which it is by violence tranſpoſed. Secondly, that this body ſhould bee reſtored home, and vnited to the *Sphericall* ſubſtance of the Earth, in which it muſt chiefly ſeeke its preſeruation. That theſe two ends are beſt and ſooneſt compaſſed by a right line is moſt manifeſt: For firſt a *ſepa-*

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paration from the place to which it is moued, is more quicke & expedient by a right line; foraſmuch as crooked and circular lines, turne backe as it were into themſelues againe. Alſo the vnion and coniunction of a part with the *Spheare* of the *Earth*, is moſt indebted to a right motion, becauſe (as wee haue declared) the way is ſhorter. Secondly, it may bee alleaged, that *Nature* is an *vniforme* and neceſſary Agent, reſtrained to one only bound or end, and therefore can neither ſtrengthen, weaken, remit or ſuſpend the action, but workes alwayes by the ſame meanes, the ſame effects; whence it is that ſhe chuſeth a right line, being but one betwixt two points; whereas crooked lines may bee drawne infinite, and the motion directed by crooked lines would proue various and oppoſite to the preſcript of Nature. Moreouer ſhould wee imagine that nature at any time wrought by a *crooked* or circular line, it might be demanded, from what Agent this obliquity ſhould ariſe? not from Nature it ſelfe: becauſe (as wee ſaid) ſhee worketh alwayes to the vtmoſt of her ſtrength, hauing no power to remit or ſupend her actions. But a crooked motion ariſeth from the remiſſion or ſlacking of the Agents force, and turning it away from the intended end, which only findes place in Free and *voluntary* Agents. Neither comes this Deflexion from the *medium*, or Aire; becauſe it can haue no ſuch power to reſiſt. Thirdly, if the motion were not performed in a right line, it could haue no oppoſite or contrary; becauſe (as *Ariſtotle* teacheth) *To a circular or crooked motion, no other motion can bee oppoſite or contrary in reſpect of the whole circle; but only in regard of the Diameter*, which is alwayes a right line. By this it is plaine, that a *waighty point* conſidered in it ſelfe abſtractly, cannot but be carried to the center in a right line: which right line, *really* and *Phyſically* points out vnto vs a *Radius* or *Beame* drawne from the *center* to the *circumference*, to ſhew that the God of Nature in compoſing the earthly globe, both obſerued and taught vs the vſe of Geometrie.

1º de cælo cap. 4.

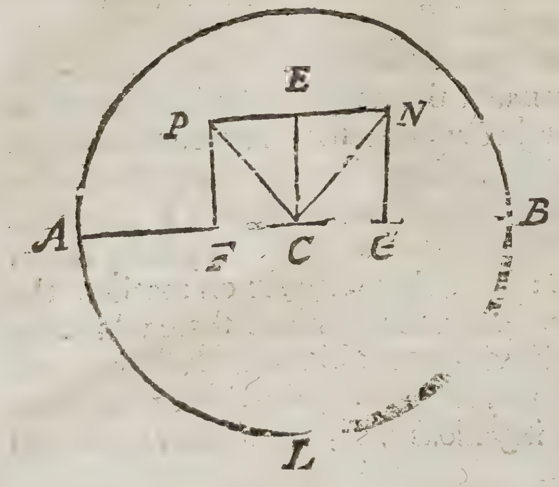
2 *A point mouing toward the Center, will moue ſwifter in the end, then in the beginning.*

This hath been plainely obſerued by experience, that a *ſtone* let fall from a towre or high place, will in motion grow ſwifter and ſwifter, till it approach the ground or place whereon it falls. The reaſon may bee giuen from the *Aire*, which reſiſt ſo much the leſſe, by how much the body deſcendeth lower toward the *Earth* or center; becauſe when it is higher, the diſtance being greater, the parts of the *Aire* will make more *Reſiſtance*. The reaſon rendred by *Ariſtotle* of this *Reſiſtance*, is, becauſe in the beginning of the motion, the ſtone or heauy body findes the Aire *quiet* and *fixed*: but being once ſet on motion, the higher parts of the Aire, ſucceſſiuely moue thoſe which are vnder, being driuen by the violence of the ſtone ſo falling, and prepare, as it were, the way for his comming. This reaſon may in ſome ſort content an ingenious wit, till a better bee found out.

10 So much for the motion of a heauy point or center: it remaines that we treate next of the motions and conformity of *Magnitudes* to the center of the Earth: wherein we conſider not only the *Center* or middle point, but the whole maſſe of the magnitude, whoſe motion and conformity ſhall bee expreſſed in this Theoreme;

1 *The motion of a magnitude toward the center, is not meerely* naturall, *but* mixt *with a* violent *motion*:

This may eaſily bee demonſtrated; becauſe no point of any magnitude is moued to the Center naturally, but the *middle point* or center of the magnitude: For although the *Center* bee moued in a *perpendicular* line, which makes right angles with the Horizon; yet the extreme parts are moued in lines *parallell*, which cannot poſſibly make right angles with the Horizon, or meet in the Center; which may bee ſhowne in this Figure.



gure. Let there bee a Circle as A B L. This done, wee will imagine a certaine magnitude hanging in the Aire, and tending to the Center C, which is ſignified by the line P E N. It is certaine that the Center of the magnitude E, will moue and conforme it ſelfe downeward toward the center of the Earth by the line E C, which motion will bee *naturall*, as that which is deriued to a center from a circumference by the direct *Radius*, which is the Rule of all naturall motions: But the other parts without the center of this magnitude, cannot moue but in ſo many lines, which ſhall bee *parallell* the one to the other: as for example, the point N muſt needs moue in the line N G, and the point P in the line P F, which being of equall diſtance, will neuer concurre in the Center, and therefore cannot bee eſteemed naturall rayes of the circle; whence wee may collect, that the motion of theſe parts is not *naturall*, but *violent*: for if any ſhould imagine the motion of theſe parts to be naturall, then ſhould the point N moue to the center of the Earth by the line N C, and the point P. by the line PC; and ſo by how much the more any waighty body ſhould approach the Center of the Earth, by ſo much it ſhould bee diminiſhed and curtailed in his quantity: ſo that in the Center it ſelfe, all the parts ſhould concurre in an *Indiuiſible* point, which is abſurd & contradicts all reaſon.

11 Hitherto haue we ſpoken of the conformity of all Earthly and waighty bodies to the Terrene center, as they are taken *Abſolutely*. It

now remaines that we ſpeake of theſe bodies as they are taken *comparatiuely*, being compared one with the other.

This diſcourſe properly belongs to an art which is called *Staticke* and *Mathematicall*; whoſe office is to demonſtrate the affections of *Heauineſſe* and *Lightneſſe* of all Bodies out of their cauſes. The chiefe ſenſible Inſtrument whereon theſe properties are demonſtrated and ſhewne, is the *Bilanz* or Ballance. But theſe ſpecialties wee leaue to ſuch as haue purpoſely written of this ſubiect: amongſt which the moſt ancient and chiefe is *Archimedes*, whoſe heauenly wit ouertooke all ſuch as went before him, and out-went all ſuch as followed. Enough it will ſeeme in this Treatiſe to inſert a propoſition or two *Staticall*, to ſhew the *Conformity* of two magnitudes, and their proper Center, mouing downeward toward the Globe of the *Earth*, and it's *Center*.

1 *The lines wherein the centers of two heauy bodies are moued downeward, being continued, will meet in the Center of the Earth.*

A heauy point or Center (as wee haue demonſtrated heretofore in this Chapter) is moued toward the Center of the world in a right line, which is imagined to bee a *Ray* of the whole Spheare deriued from the circumference to the Center, & therfore it is impoſſible they ſhould bee parallell or Equidiſtant, but concurrent lines. But becauſe the whole diſtance betwixt vs and the Center is very great; it muſt needs happen that in a ſmall ſpace the concurſe of perpendicular lines is altogether inſenſible. For if two perpendicular or heauy points moued in a line, ſhould be diſtant one from the other the ſpace of 10, a 100 or more feet; becauſe this diſtance is very little in reſpect of the *ſemidiameter* of the Earth: the angle of concurſe muſt needs be very little, and by conſequence thoſe two rayes or lines, meaſuring the deſcent of two heauy Bodies, will ſeeme altogether *Equidiſtant*. Yet that there is ſuch a concurrence, *Nature* and

Reaſon will eaſily conſent. Hence wee may detect a popular errour beleeued of the vulgar, that the walls of houſes ſtanding vpright are *parallell* and of equall diſtance; when contrariwiſe it is plaine that ſuch walls are erected by a *perpendicular*, and meaſured by perpendicular lines, which being drawne out in length will meet in the Center of the Earth. The like may we pronounce of a deep *Well*, whoſe ſides or wall are erected perpendicularly; and therefore ſhould it reach as farre as the Center, it muſt needs follow that the ſides growing neerer and neerer as they approach the Center, would in the end cloſe or ſhut vp into a *Pyramide*, whoſe *Baſe* ſhould bee the mouth of the Well. Likewiſe if a Tower ſhould bee erected to the Heauens, it would be ſtrange to imagine, how great and broad the vpper part of it would bee in reſpect of the bottome. Hence againe it may be inferred, that any pauement leuelled by a perpendicular is not an abſolute plain, but rather the *portion* or Arch of a *ſphericall ſuperficies*, whoſe Center is the ſame with the Center of the whole Earth. But this roundneſſe in a ſmall diſtance is no way ſenſible: but in a great pauement of foure or fiue hundred paces leuelled perpendicularly; it will make ſome ſhew of roundneſſe: whence it muſt needs follow, that an extraordinary great pauement meaſured ouer by a right line, cannot be called leuell or equally poized, foraſmuch as it is not euery where equally diſtant from the Center of the Earthly Globe.

2 *Two heauy bodies of the ſame figure and matter whether* Equall *or* Vnequall, *will in equall time moue an equall ſpace.*

This propoſition being inuented by one *Iohannes Baptiſt* de *Benedictis*, is cited and confirmed by *Iohn Dee*, in his Mathematicall Preface to *Billingſlie's Geometry*; Which corrects a common errour of thoſe men, which ſuppoſe the lighter bodies generally not to moue ſo faſt downeward to the Center as the heauy. The demonſtration of this Theoreme, being drawne from many *Staticall* principles, which we cannot here conueniently inſert, wee are enforced to omit: as intending not the ſearch of theſe matters any farther than they direct vnto the knowledge of *Geographie.* Yet were it no hard matter to giue a more popular expreſſion of this reaſon out of the proportion betwixt this *weight* of the heauy Body, and the Reſiſtance of the *Medium*. Becauſe the Greater Body, as it is carryed down-ward by a greater force and violence; ſo on the other ſide it meets a greater impediment, being not able ſo ſoone to diuide the Aire, as the Leſſer: Likewiſe the Leſſer body falling with leſſe force, yet is more apt to diuide it then the other. Whence both ſet the one againſt the other, there will be no diſparity in the time and motion.

12 Of the *primary* conformity of the Terreſtriall bodyes in the conſtitution of the Terreſtriall Spheare, wee haue treated: It now ſeemes needfull that we deſcend to the *ſecondary*, which is the inclination of all the parts, to make a round Spheare or Globe.

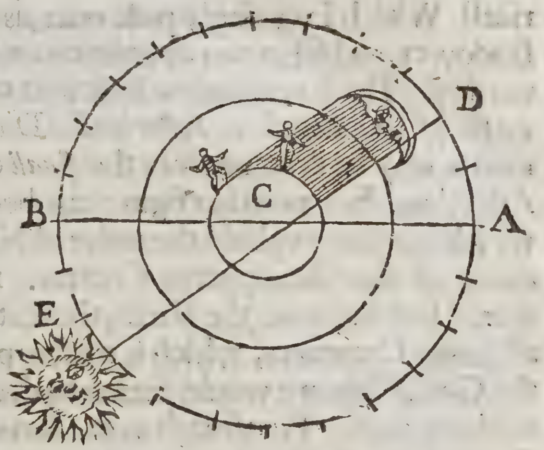
1 *The Terreſtriall Globe is round and Sphericall.*

This Propoſition is of great vſe, and one of the chiefeſt grounds in Geographie. The ground of the Sphericall figure of the Earth, is the right motion of heauy bodies to the center. For this right motion (as wee haue ſhewed) doth expreſſe one *Beame* of the circle, by whoſe circumuolution is produced the circumference of it, which we call *Secundary conformity* of the parts of the Earth; in ſo much as it growes *Mathematically* (as it were) out of the firſt. For this Sphericall figure of the Earth, ſundry ſound reaſons are vrged by *Geographers*: Firſt, that the Earth is round according to its *Latitude*, that is, from North to South. Secondly, according to its *Longitude*, that is, from Eaſt to Weſt, and therefore muſt it needes bee abſolutely Sphericall. The firſt part is ſhewed, that it is round from North to South; for if a man trauell from North to South, or contrariwiſe from South to North, hee ſhall perceiue new ſtarres in the Heauens to appeare and ſhew themſelues, which before hee could not ſee: which can be referred to no other cauſe then the Sphericall conuexity, or ſwelling of the Earth. As for example; The ſtarre which is called *Canopus*, which is a notable ſtarre in the ſhip; appeares not at *Rhodes*, or at leaſt from high places. But if you trauell forth Southward from *Italy* into *Egypt*, to *Alexandria*, the ſame ſtarre (*Proclus* obſerues) will manifeſt it ſelfe to your ſight the fourth part of a ſigne aboue the *Horizon*. *L. de Sphær.* From whence wee may draw a ſound proofe, that there is a Sphericall and gibbous conuexitie, which interpoſeth it ſelfe betwixt *Rhodes* and *Egypt*. In which place, the people who inhabite that part of *Egypt*, which borders vpon *Arabia*, which are called *Troglodites*, of their dwelling in caues, cannot ſee any Starre of the *Great Beare*. Whence wee may conclude, that the Earth from the North to the South, is round and Sphericall. For if otherwiſe the Earth were *plaine*, all the Northerne ſtarres would appeare to the inhabitants of the Southerne Regions; and on the other ſide, all the other Southerne conſtellations would bee ſeene of the Northerne inhabitants, which ſenſe and reaſon altogether contradict. *Secondly*, that the Earth is round according to its *Longitude* betwixt Eaſt and Weſt, may bee proued by two reaſons. The firſt is taken from the riſing and ſetting of the *Sunne*, *Moone*, and other Starres, for as much as all they doe not ariſe or ſet with all Nations at the ſame houres. For with the inhabitants of the Eaſt, the Sun-riſing is ſooner; with the Weſterne inhabitants later; and that in ſuch proportion, that euery 15 degrees meaſured out by the Sunnes diurnall motion, adds or ſubtracts one whole houre in the length of the day. This is found by experience and teſtimony of *Coſmographers*, that the Sunne riſeth with the *Perſian*, inhabiting toward the Eaſt, foure houres ſooner then to the *Spaniard* in the Weſt. Sundry other the like examples may bee alleaged; all which we muſt needes impute to the Sphericall roundneſſe of the Earth, proportionally increaſing betwixt Eaſt and Weſt. The other reaſon to confirme this laſt point, is drawne from the Ecclipſes of the Sunne and Moone, which would not appeare in diuers places, at diuers houres, if the Earth were plaine or ſquare. We ſee plainly that Ecclipſes of the Moone appeare ſooner to the

Weſterne people, but later to the Eaſterne. As (according to *Ptolomie*) in *Arbela* a towne of *Aſſyria* (where *Alexander* ouercame *Darius* the laſt King of the *Perſians*) was there obſerued an Ecclipſe at the fifth houre of the night, which ſelfeſame *Ecclipſe* was ſeene in *Carthage* at the ſecond: which to any man appeares plainly in this figure here inſerted. In like manner an Ecclipſe of the Sunne at *Campania* which was obſerued betwixt 8 and 9. was (as *Pliny* reports) ſeene in *Armenia* betwixt 10 and 11 of the clocke. Whence may be gathered that this difference of appearance aroſe from the roundneſſe of the Earth, interpoſing it ſelfe betwixt theſe two places. Another reaſon to proue the *Spericall* figure of the Earth, is drawne from the *Ecclipſe* of the *Moone*, wherein the obſcured point is deſcribed by a *Sphericall* figure, which muſt needs argue, that the body which cauſeth the ſhadow, is alſo round. For as the *Optickes* teach vs, the ſhadow is wont to follow and imitate the opacous body whence it proceedes, and all men confeſſe that the *Ecclipſe* of the *Moone* is made by the interpoſition of the Spheare of the Earth betwixt the Sun & Moone, intercepting the beames of the *Sun*, which ſhould illuſtrate & lighten the *Moone*. The third reaſon may be taken from the abſurdities which would follow, ſhould we admit any other figure beſides. For granting it to be *plaine* (as ſome of the *Platoniſts* haue imagined) it would neceſſarily follow in reaſon; 1 That the *Eleuation* of the Pole would bee the ſame in all the parts of the Earth. 2 That there Would bee the ſame *face* and appearance of the Heauens in all places. 3 That the Sunne and Moone, with other ſtarres, would in all places ariſe alike at the

Lib. 1 *geog. cap.* 4.

Lib.2.*c*.72.



ſame houres. 4 That all *Ecclipſes* would appeare to all places at the ſame houres. 5 That the ſame *quantity* of dayes & nights would bee at all places. 6 That the *ſhadowes* would bee euery where alike; and one Region would not bee hotter or colder then another, all which would plainly ſtand oppoſite to reaſon and experience. As many or more would proue the abſurdities of thoſe, that aſcribe to the Earth any other figure then Sphericall. Which I willingly paſſe ouer, as not willing to fight with ſhadowes, and faigne an oppoſition, where I ſcarce finde an aduerſary. Theſe reaſons are ſufficient to proue, that the whole maſſe of the *Earth* is *Sphericall.* Diuers other popular arguments may be drawne from the *finall* cauſe to countenance this Aſſertion. For no other figure can bee aſſigned to the Earth, which can more vphold the order of Nature, or ſpeake the wiſdome of the Omnipotent Creator. 1 Becauſe ſuch a Figure would beſt beſeeme the Earth, the ſeate and dwelling-place of all liuing Creatures, which is moſt capable: becauſe otherwiſe the God of Nature would ſeeme to doe ſomethiug in vaine, and without cauſe: Foraſmuch as the ſame *capacity* might bee confined within ſtricter bounds. Now it is apparant to all *Mathematicians*, that amongſt all thoſe figures which they call *Iſoperimetrall*, a *Circle* is the moſt *capable*, and amongſt the reſt, thoſe which approach neereſt vnto a circle. And as wee eſteeme of a circle deſcribed in a plaine ſurface, ſo muſt we iudge in *ſolides* of a *Speare.* Which profitable Geometry of Nature wee ſhall finde inſtilled into moſt liuing Creatures, who by a certaine Naturall *Inſtinct*, without the vſe of Reaſon, make their Neſts and reſting-places of a *Sphericall* Figure, as moſt conuenient, and of greateſt capacity; as experience ſhewes vs, in the Neſts of Birds, and Bee-Hiues, wherein the cells are faſhioned round & Sphericall. 2 We ſhall find the holy Scriptures conſonant to this opinion in diuers places; but that it might ſeeme impiety to vſe thoſe ſacred helpes in a matter out of controuerſie, and needing no ſuch Demonſtration.

2 *The rugged and vnequall parts of the Earth, hinder not the Sphericall roundneſſe of it.*

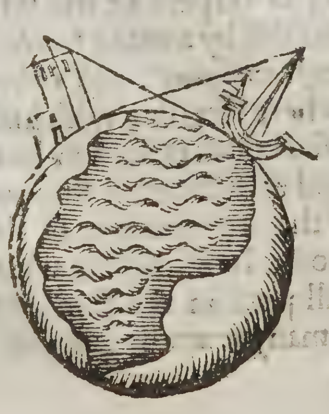
It is thought by ignorant people, that the Earth is not round, becauſe of the rugged and vneuen parts of the *ſuperficies* of it: For ſome-where it ſwells with great and high *mountaines*, rocks, and hills; Other-where it ſeemes indented, and (as it were) trenched into valleyes, & concauities; all which ſeeme to detract from a true Sphericall *ſuperficies*; becauſe in ſuch a one, euery line drawne from the Center to it, ſhould bee equall one to the other. Indeed that the *Globe* of the Earth is not *Abſolutely* and *Geometrically* round, as an *Artificiall* Spheare, is confeſſed by *Eratoſthenes*, cited by *Strabo* in his 1 booke of *Geographie*: whence *Pliny* in his 2 booke, *cap* 21. ſaith, that the *Earth* & *Water* make one Globe, not ſo abſolutely round as the Heauens, but much different, as alſo *Strabo* confirmes. This propoſition depending on theſe 3 reaſons which follow; will ſhew that this *Inequality*, how great ſoeuer it ſeeme to the ſight, is altogether *inſenſible*, and bearing no proportion with the huge vaſtneſſe of the whole *Earth*. The firſt is taken from the perpendicular hight of the greateſt and higheſt mountaine, which is ſeldome or neuer found to exceed 10 miles, (although few *Mathematicians* will grant ſo much) whereas the whole Diameter of the Earth containes no leſſe then 7200 *Engliſh miles*; ſo that theſe hils compared to the thicknes of the *Earth*, are but as 10 to 7200: which indeed hath no *ſenſible proportion*. The ſecond is taken from the *Ecclipſe* of the *Moone*, which being cauſed by the ſhadow of the interpoſed *Earth*, is deſcribed by a *Sphericall* figure, without any vnequall or rugged parts, which no doubt, would appeare, if theſe parts challenge any due proportion, or ſenſible quantity, in reſpect of the whole *Earth*. Thirdly, ſome haue illuſtrated this by a round *bowle*, or ball, whoſe externall ſurface, although *vnequall*, and *indented* here & there with ſcotches, other-where ſwelling with knobs, will notwithſtanding being interpoſed betwixt the Sun-beame and a wall, or ſuch place, giue a round or Sphericall ſhadow in the ſame wall or plaine, in regard of the little quantity of theſe ſmall parts in reſpect of the whole Body. In like ſort muſt wee imagine the mountaines and vnequall parts in the face of the Earth, to bee no otherwiſe then as ſo many warts or pimples in

Lib. 1.

the face of man, which cannot alter his due proportion or ſymmetry of the parts.

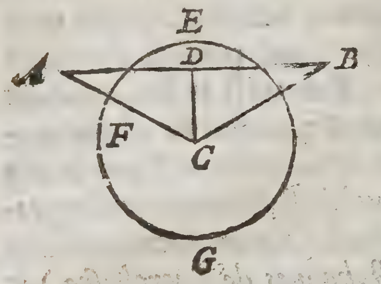
3 *The* Water *concurring with the* Earth *in the Globe is alſo Sphericall.*

It is a propoſition agreed on by *Archimedes*, and almoſt all the ancient *Mathematicians* of any note, that the *ſuperficies* of the Water, or any other liquor, ſtanding and ſubſiſting quietly of it ſelfe, is *Sphericall*; whoſe center will bee the ſame with the center of the whole *Earth*, which we are here to handle, becauſe it appertaines to the making vp of the *Terreſtriall Globe*; although wee ſhall haue occaſion hereafter to ſpeake ſpecially concerning the *Water* in *Hydrographie*, in the ſecond part of this Treatiſe. The reaſons to confirme this aſſertion, beſide thoſe that in generall proue the *Sphericity* of the Terrene globe are diuers: 1 It is obſerued that *Paſſengers* in a Ship, lanching out into the deepe from ſome Hauen, will firſt perceiue the Towers, Buildings, Caſtles, Promontories, and Trees ſtanding on the land, in their perfect figure and greatneſſe: ſayling farther off, they will obſerue them on the lower part, little & little diminiſhed, vntill ſuch time as the tops only of the houſes and trees will bee *viſible*. In like ſort they which tarry on the Land, will firſt eſpye the top and maſt of a Ship approaching, which ſight will bee perfected more and more, as the Ship drawes toward the land, and at laſt all parts of it will ſhew themſelues; which accident can bee caſt vpon no other cauſe, then the *Sphericall* roundneſſe, and ſwelling of the water; which, if the diſtance be great, interpoſeth it ſelfe betweene the ſtation on the Land and the Ship wherein Paſſengers are conueyed; which experiment is expreſſed in this Diagramme here annexed. Certaine *Platonicks*, of which the chiefeſt is *Patricius* a late Writer, would aſcribe this



this experiment to the impediment of the ſight, cauſed partly by the diſtance which cannot perfectly repreſent the obiect, partly by the interpoſed vapours ariſing in the Sea; partly by the quiuering light which is ſpread by the refraction of the Sun-beames in the water. I deny not but theſe cauſes may ſomewhat hinder, and cauſe that the true and perfect *ſpecies* of a body cannot alwayes viſit the ſight. Yet will it bee euident that this is not all, but that the *Sphericall* roundneſſe of the water will proue a greater impediment where the *diſtance* is any thing greater. But for one of *Patricius* his ſhifts concerning vapour ariſing out of the Sea, (to which *Clauius* ſeemes alſo to conſent in his Commentary vpon *Johannes de Sacroboſco*) it makes more for our aſſertion then his. For that which is ſeene in a thicke *medium*, according to the doctrine of the *Opticks*, ſeemes greater in quantity, and by conſequence neerer, and ſo higher then would otherwiſe appeare: as wee ſee by experience, that the *Sunne* ſometimes is ſeene of vs before it aſcend aboue the *Horizon*, becauſe of a refraction of it's beames in a *thicke matter*. Wherefore it were rather to be imagined, that a tower ſeene at Sea, or a ſhip from the land, through theſe thicke and groſſe *vapours*, ſhould appeare higher, and ſeeme neerer then if it met not with ſuch vapours. Secondly, what is vrged concerning the trembling *light*, cauſed by a refraction of the Sun-beames in the water, is of no force: For although ſuch a light might cauſe an impediment or hinderance to the ſight; yet would not this decrement or hinderance bee by degrees and in ſuch proportion as we find it to be correſpondent, to wit, to the diſtance interpoſed. And much wonder it is that *Patricius* (as my learned Friend Mr *R. Hues* obſerues) being, as it ſeemes very well read in the ſtories of *Spaniſh* nauigations, ſhould not bee conuinced out of the Nauigation of *Magellane*, who taking his iourney toward the *Southweſt* parts, paſſed by the *Magellane* ſtraights, now called by his name, and ſo returned by the *Cape of Good Hope* into *Spaine*, to which wee may adde the voiages of *Drake*, *Candiſh*, and many others. The ſecond reaſon is vrged by *Ariſtotle* in his 2d booke *de cœlo*, and hath its ground in *Archimedes lib. 1. de Aqua-vectis*, which is formed in this

ſort



ſort. The nature of the water is to affect and flow to the lower place, whence it muſt neceſſarily bee inferred that it muſt bee round, for otherwiſe it ſhould not alwayes obtaine the lower place. The reaſon of the conſequence ſhall bee expreſſed in this figure; for if we aſcribe to the water a plaine ſuperficies, let it for example bee A D B, and from the center of the earth C. let there be deſcribed a circle, to wit, E G F, then let there be drawne C D, a perpendicular line to A B, and let A C and B C be ioyned together. Now becauſe the right line C D is leſſe then C A, or C B, as will appeare euidently by ſenſe; it will be plaine that the point D will be in a lower place then the point A or B, becauſe D is neerer to the Center; for as much as D C is but a part of a beame of the circle whereas A C and C B euidently exceed that quantity or proportion. Another reaſon there is, commonly drawne from the roundnes of drops caſt on the ſand, as alſo from water in pots, whoſe *ſuperficies* ſeemes to ſwell aboue the brimmes; but this reaſon, as we ſhall proue in place conuenient, is rather againſt this aſſertion then for it; becauſe indeed, wee affirme the water to be round, but ſo as it claimes the ſame *Center* with the *Center* of the *Terrene* Globe; and therefore cannot be ſenſible in ſo little a portion, as a drop, or pot of water. This propoſition being ſufficiently proued by theſe two reaſons; it is needfull in the ſecond place that wee anſwer certaine obiections caſt in by the ſaid *Patricius* againſt our aſſertion. Euery *ſurface* of the water (quoth *Patricius*) is either only plaine, or only round, or both plaine and round, or neither plaine nor round: Firſt that it is not both *plaine* and *round*, ſeemes very euident, for ſo it ſhould admit of *contrariety*: Neither can one part be *plaine* and another *round*, becauſe the water is an vniforme and homogeneall body, not conſiſting of ſuch vnequall parts: that it ſhould neither bee plaine nor round ſeemes more impoſſible, becauſe few or none haue dreamt of any other figure. Laſtly, that it is not *round* only, hee labours to confirme by ſundry reaſons and experiments. Firſt, he teſtifies of himſelfe, that ſayling in the Sea, he plainely ſaw in the morning before Sun-riſing, the Mountaines of *Corſica*; which afterward, aſſoone as the Sunne was riſen, vaniſhed out of his ſight. Whence he concludes, that this proceeds not from the roundneſſe of the Earth, but from ſome other cauſe. But this argumēt to iudicious men will ſeeme very weake, 1 Becauſe it depends altogether on the authority and credit of *Patricius*, whoſe aſſertion I take to bee no better then another mans deniall. 2ly were this argument euery where found, yet would it proue no other thing, but that this effect were not to be imputed to the Sphericall ſwelling of the Earth. Whence cannot bee drawne any generall concluſion, that the *Earth* or *Water* is not *Sphericall*. Wee deny not in the meane time, that other cauſes ſometimes concurre, which may hinder or take away the ſight of obiects from thoſe who ſaile on the Sea. The ſecond experiment, *Patricius* deſcribes in this manner. At a certaine Towne called *Comaclum* (ſaith hee) there is a very great poole; through which poole or lake ſome 3 yeares agoe, it was my chance to bee carried in a boat. The bottome of the water almoſt all the way in all the iourney appeared to bee leſſe then 2 foot in depth from the top. The way increaſing, at firſt the lower parts and foundations of houſes, then the tops and princely pinnacles began to vaniſh from our ſight: at laſt hauing ſcarce paſſed 6000 paces, a Tower 72 foot high began to appeare, as it were cut off by the middle, and from the middle part vpward appeared viſible; but after 10000 paces it was taken out of ſight: I would here aske the *Geographers* (quoth *Patricius*) whether in ſo ſhort a diſtance, wherein the bottome for the whole ſpace ſurpaſſed not two foot in depth, the water could aſcend to 72 foot? Had it beene my chance to haue gone with *Patricius* ouer the lake, I might perhaps by obſeruation of this experiment, haue giuen a more probable coniecture of the cauſe. Neuertheleſſe being vnacquainted aſwell with the place, as the truth of his obſeruation, I may perhaps gueſſe ſomewhat at his errour. Firſt then, whereas hee auerres, that paſſing along for the ſpace of a 1000 paces, a *Tower* of 72 foot high, ſeemed cut off by the midſt, which at 10000 vaniſhed out of ſight. I confeſſe that in ſo ſhort a ſpace the ſwelling of the water inter-poſed, could not be ſo great as to hinder the ſight, and bee the cauſe of this effect: wherefore ſome other *Accidentall* cauſe muſt bee ſought out. For the finding out of which to come as neere as I can, I would make inquiry, whether this paſſage of the *Boat* was directly *forward* from the Tower on the Water, no land inter-poſed: or *Indirectly* ſide-wiſe, in ſuch ſort, as the ſhoare might be placed betwixt their ſight and the Tower mentioned: The former no wayes can be imagined; forasmuch as it not only contradicts the grounds of our receiued *Philoſophie*; but alſo of *Patricius* himſelfe: for giuing the Earth a *plaine* ſurface, or *Angular*, or any other forme, it were impoſſible that in ſo ſhort a diſtance, ſuch an effect ſhould happen out of the figurature of the water. If the paſſage were *oblique* or indirect, in ſuch wiſe as the ſhoare might any way inter-poſe it ſelfe betwixt the *Boat* and the *Tower*, it were eaſie to imagine how ſuch an experiment ſhould happen: for the land by which the Boat might bee carried, might haue an aſcent by ſuch Degrees, as the Tower at 1000 paces might bee for the halfe of it obſcured, and at laſt bee altogether taken out of ſight. This reaſon then of *Patricius*, ſeemes rather to bee aſcribed to the Land then the Water. The third reaſon of *Patricius* is drawne from the *Homogeneity* of the Water. If the water (ſaith hee) haue a round *ſuperficies*, the parts of it would challenge the like figure, becauſe in *homogeneall* bodies, the ſame reaſon is to bee giuen of the *whole*, and of the *parts*: But the parts of the water are not Sphericall, as may bee proued by diuers inſtances: 1 Becauſe water in the mouth of a pot, ſeemes not to haue any ſuch *Sphericall* roundneſſe: for although at the brinke it ſeeme to bee reſtrained aboue the pot, yet no ſuch ſwelling appeares in the middle. 2^{ly} That riuers are kept in by their bankes, which otherwiſe would flow abroad. 3^{ly} That riuers, when by the melting of ſnow, they ſwell ſo great, as they can hardly bee contayned within their bankes, doe not ſeeme higher in the middle, then in other places. 4^{ly} If any man from one ſide of the riuer to the other, leuels at any marke, he may ſurely hit it: which hee ſhould not doe, if there were any Sphericall ſwelling in the midſt, which might hinder the ſight. 5ly and laſtly it ſeemes ſo vnlikely, that the water ſhould riſe in the midſt, that it is more probable it ſhould be more hollow; in that we plainly obſerue that all filth and rubbiſh carried from the bankes into the riuer, is wont to ſettle and ſwimme in the midſt. Notwithſtanding all theſe argumẽts of *Patricius*, our ground is yet vnſhaken; 1 Concerning ſmall drops, and water in the mouth of pots; it is found to be round and Sphericall, though not exactly: the reaſon whereof wee ſhall declare hereafter. This roundneſſe, I confeſſe, ſerues not any way to the confirmation of this aſſertion, becauſe the *Sphericity* and roundnes which wee auerre to be in Water, hath for its center, the center of the whole Earth: and therefore in ſo ſmall an arch or ſection, as the bredth of a pot, or a drop of water, cannot poſſibly haue any ſenſible appearance or exiſtence. And we muſt needs confeſſe, that this experiment was very fondly vrged to this purpoſe by ſome of our *Geographers*, and ſuch as ſtands not with any demonſtration. Which granted, ſufficiently anſwers all the reaſons laſt vrged by *Patricius*, except the laſt. For as much as he requires in the Water, a ſenſible appearance of this roundneſſe in euery riuer or little parcell of water, which cannot bee admitted. Touching the laſt thing which hee vrgeth, that all the rubbiſh and filthy matter, is from the bankes carryed into the middle, whence he would inferre the middle to be hollow and loweſt; we can anſwer diuers wayes: 1 That this experiment is not alwayes certaine, becauſe euery man may oftentimes ſee the contrary; to wit, that ſuch filthy rubbiſh rather vſeth to cleaue to the banks of the riuer, then to float into the midſt. 2ly That if any ſuch thing happen, it is becauſe of the torrents which run violently from the banks into the midſt, carrying with it ſuch things as are light, the ſteepneſſe of the place being greater, the current wider or ſwifter. But nothing here can bee concluded to proue the water according to his naturall force, to be either plaine or hollow in the midſt, which this Aduerſary vndertooke to demonſtrate.

CHAP. III.

Of the Partiall magneticall affections in the Spheare of the Earth.

1 HItherto haue we diſcourſed of ſuch affections of the Terreſtriall Spheare as are *Elementary*, and knowne heretofore to ancient Philoſophers: It followes in the next place that we treat of *Magneticall* affections, to wit, ſuch as follow the magneticall nature of the Earth.

Of the *vertue* and propriety of the *Load-ſtone* many haue written, but few ſought out the true nature. The inuention of it is attributed to a certaine heards-man, who hauing his ſhooes ſhod with iron, and an iron-pike in his hand, reſting himſelfe on a quarry of *Load-ſtone*, could hardly remoue himſelfe frō thence. But this ſeemes rather a pleaſant *Poeticall* inuention, then a true Hiſtory, hauing no good Author to auouch it. But to let paſſe the firſt Inuention, being a matter rather indebted to *chance* then *induſtrie*; no ſmall difficulties haue diſcouered themſelues in the inuention and finding out of the cauſes of *Magneticall* properties. Somewhat, I cōfeſſe, hath been written of ſuch magneticall affections as haue been moſt knowne; ſuch as is the vertue *Attractiue*, by which it drawes to it ſelfe iron, or ſteele; as alſo the vertue *Directiue*, by which a needle touched with the *Magnet*, directs and conformes it ſelfe North and South. The reſt of *Magneticall* proprieties I find in ancient Writers, as little knowne as their cauſes; & if any matter herein were broached, it was merely coniecturall, and depending on no certain demōſtration: neither had we any certaine or ſatisfactory knowledge of this thing, vntill ſuch time as it pleaſed God to raiſe vp one of our Countrymen *D. Gilbert*, who to his euerlaſting praiſe hath troden out a new path to *Philoſophy*, and on the Loadſtone erected a large *Trophie* to commend him to poſterity. This famous Doctor being as pregnant in witty apprehenſion, as diligent in curious ſearch of naturall cauſes: after many experiments, and long inquiry, found the cauſes of moſt magneticall motions and proprieties hid in the magneticall *temper* and conſtitution of the *Earth*, and that the Earth it ſelfe was a meere *Magneticall* body challenging all thoſe proprieties, and more then haue expreſſed themſelues in the Load-ſtone. Which opinion of his was no ſooner broached, then it was embraced and well-commed by many prime wits, aſwell *Engliſh* as *Forraine*. In ſo much that it hath of late taken large root, and gotten much ground of our *vulgar Philoſophie*: Not that in the maine ſcope and drift of it, it contradicts or croſſes all *Peripateticall* principles, or the moſt part of ſuch grounds as haue hitherto borne the ſtampe aſwell of *Antiquity*, as of *Authority*: But that it hath brought to light matters of no ſmall moment, which neuer found any ground or footſteps in our ordinary Philoſophie. This new Philoſophie I dare not commend as euery-where perfect and abſolute, being but of late yeeres inuented, and not yet brought to mature perfection: yet would it ſauour of little ingenuity or iudgement in any man, peruerſely to deny all ſuch Magneticall affections in the Earth as are grounded on plaine experiments and obſeruation, ſith no *Philoſophie* was euery way ſo exact, but required experience dayly to correct it. I intend not here an abſolute diſcourſe of *Magneticall* Bobies and Motions, but leaue it to their ſearch whoſe experimentall induſtrie is more ſuteable to ſuch a ſubiect. Onely I will ſhew ſome generall grounds appertaining to the conſtitution of the *Terreſtriall* Globe, which I hold neceſſary for a *Geographer*. Wherefore ere I curiouſly diſtinguiſh theſe Magneticall proprieties of the Earth into other ſeuerall kindes, I will ſet downe this Theoreme, as a ground or foundation of that which followes.

1 *The Terreſtriall Spheare is of a Magneticall nature and diſpoſition.*

A *Magneticall* Body by ſome is defined to bee that which ſeated in the Aire, doth place it ſelfe in one place *naturall*, not alterable. This ſituation is ſuppoſed to agree to all the Starres, eſpecially to the great Globes of *Saturne*, *Iupiter*, *Mars*, and the *Sunne*; as alſo to ſuch as giue their attendance on them, lately detected by the Trunk-ſpectacle; to wit, thoſe two Starres which moue about *Saturne*, the foure which moue about *Iupiter*, the two which circle about the *Sunne*, as *Venus* and *Mercurie*; and laſtly the *Moone*, which encompaſſeth the Spheare of the Earth. But to let paſſe thoſe other Globes, as farther off, and therefore leſſe ſubiect to our ſearch: our diſcourſe ſhall only touch the Earth whereon wee liue, which wee ſhall proue to partake of a certaine Magneticall vertue or inclination: which to ſhew more openly, we muſt vnderſtand, that all Magneticall Globes haue ſome parts of their bodies which bee alſo Magneticall, which being diuorced from their proper Spheare, & meeting no obſtacle, will ſettle themſelues to the naturall ſituation of their peculiar *Orbes*. Which wee may plainly perceiue in the Spheare of the Earth, wherein wee ſhall find two *Magneticall* minerals; whereof the one is the *Load-ſtone*, attracting iron or ſteele; the other the *Iron* or ſteele it ſelfe: either of theſe two, artificially hanged in the Aire, or placed in a little boat on the water, all incombrances being remoued, will conforme & ſettle their *parts* and *Poles* correſpondent to the poles and parts of the Terreſtriall Spheare, as *North* and *South*. This hath been found in all parts of the Earth by ſuch as haue trauelled round about her, as *Drake* and *Candiſh*, whoſe Compaſſes were alwayes directed Magnetically in all places which they paſſed: which we cannot aſcribe to any other cauſe then the *diſponent* faculty of the Earth's Magneticall Spheare, as ſhall appeare hereafter by demonſtration. Moreouer it hath been obſerued by ſuch as ſaile *Northerly* and *Southerly*, that the Magneticall *Inclinatory* needle, in euery eleuation of the Pole is conformed and diſpoſed to the Axell of the Earth, according to certaine angles anſwerable to the latitude of the Region, as wee ſhall ſhew hereafter. This diuerſity of conformity muſt neceſſarily ariſe, either from the *Magneticall* inſtrument in it ſelfe *abſolutely* conſidered, or els from the *Harmony* and correſpondency it hath with the Terrene Globe. It cannot be the firſt; becauſe it ſhould bee the ſame in all places and Regions of the Earth, which is contrary to experience, and our ſuppoſition. Then muſt wee needes deriue it from the Magneticall *diſponent* vertue of the whole Globe of the Earth, from which vertue the whole Earth may bee called Magneticall. Nay if we truely conſider, theſe Magneticall affections *primarily* agree to the Earth, as the mother of all Magneticall bodies; but afterward *ſecondarily* are deriued into the parts; becauſe (as *Gilbert* relates it) the cauſe of magneticall motions and affections is the magneticall *forme* of a *Sphericall* Globe; which forme firſt agrees to the whole Globe of the Earth, and ſo is deriued to all his *homogeneall* parts. Theſe parts are called *Homogeneall*, not in regard of their *Matter* and *quantity*, but in reſpect of their *Magneticall nature*, and *communion*, which in euery part is conſpicuous. If any man ſhould wonder why the Earth ſhould bee called Magneticall in regard of this minerall, which ſeemes one of the leaſt and ſcarceſt ſubſtances whereof it conſiſteth; we may many wayes anſwer, Firſt, that although the ſurface of the Earth ſeemes for the moſt part compoſed of other materials, more conuenient for the vſe of liuing Creatures which dwell therein: yet may infinite rocky mines of Magnets be couched lower toward the center, which ſtrengthen and conſolidate the Earthly Globe. Secondly, wee muſt not imagine the Magneticall ſubſtance of the Earth, to bee all one kinde of ſtone, but various: for ſomewhere it is hard & ſolide as the true magnet it ſelfe and the iron which is nothing els but a mettall decocted out of the Load-ſtone; (for *iron Oare* differs little or nothing at all from the *Load-ſtone* it ſelfe) ſomewhere againe, this ſubſtance is more thinne and fluid, being leſſe concocted as ſome kinde of *clay*, and certaine *vapours* ariſing out of the Earth, which bee magneticall: which being brought to a harder and more maſſie ſubſtance, will haue the ſame affections and motions with the Loadſtone it ſelfe. This aſſertion of the Earth's magneticall nature, wee ſhall confirme more euidently hereafter, where we ſhall proue both the *Poles*, the *Meridian*, *Parallels*, and other circles, to bee not bare *Imaginary* lines, as ſome haue thought (but to bee *Really* grounded in the magneticall nature of the Earth, and are to be ſhewed in any round Loadſtone, wrought and placed conueniently with inſtruments thereunto applied.

2 The Magneticall affection of the Earth is twofold, either *Radicall* or *Deriued* The Radicall diſpoſition we call that which is the firſt root and ground of all other magneticall motions.

3 The Radicall vertue or inclination is againe twofold, either *Motiue* or *Diſponent*. The Motiue is that by which all magneticall bodies are inclined and ſtirred vp to the motion.

In the *Reaſonable* ſoule of a man, wee haue two faculties which ſhew themſelues; a *motiue*, and a *directiue* or diſponent power: whereof the one ſtirres vp the motion, the other regulates, conformes, and directs it: The former is the *Will*, the later the *Diſcourſe* and Iudgement. This diſtinction of faculties, howſoeuer more euident in the ſoule, findes place in all *Naturall* agents: in which a Philoſopher ought to diſtinguiſh betwixt that which giues them a power to moue, and that which limits, determines, and (as the Schoolemen are wont to ſpeake) *modificates* the action. Amongſt others the magnet-ſtone ſeemes moſt to partake of theſe two powers, as that which amongſt all naturall agents (in *Gilberts* opinion) ſeemes moſt to haue reſemblance with the ſoule of a man: ſo that by an apt Trope it hath been called of many, the Magneticall ſoule of the Earth; for hence wee may well perceiue one vertue or inclination, which cauſeth the magneticall needle to moue out of its place; ano-

ther

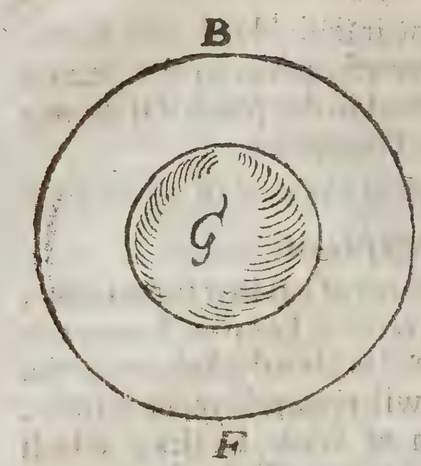
other by which it is apt to conforme it ſelfe North and South, as alſo to obſerue certaine angles correſpondent to the latitude of the place, as ſhall bee demonſtrated in due place. Of the motiue power we will produce theſe Theoremes.

1 *The Magneticall motion is excited in a ſmall & vnperceiuable difference of time.*

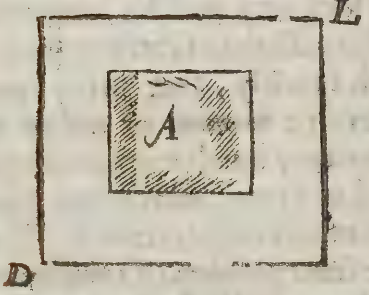
This propoſition may be ſhewed out of euident experiment, wherein euery mans ſight may be a witnes. For if an *Iron-needle* touched with the Loadſtone, be placed within the Spheare of the magneticall vertue of the ſtone, it will preſently moue it ſelfe, notwithſtanding the interpoſition of ſolide bodies, which made *Gilbert* to imagine this motion to bee effected by a meere *ſpirituall* and *immateriall* effluxe, which may well be compared to the *light*, which neuertheleſſe it ſurpaſſeth in ſubtility: for the light is moued from Eaſt to Weſt ſo quickly, that many haue thought this motion to haue been in a *moment* or *inſtant* of time. But this quicknes of motion may much more be imagined in the Magneticall vertue, being of a more ſubtile and piercing nature, as may bee gathered from this reaſon, to wit; That the light is alwayes hindered by the interpoſition of a *thicke* and *opacous* body; but the vertue Magneticall findes a paſſage through all ſolide bodies whatſoeuer; and meets with no impediment.

2 *This Motiue quality is* Spherically *ſpread through euery part of the Magneticall body.*

Here againe may wee finde a great reſemblance betwixt the magneticall vertue and the *light*; for as all light Bodies, as the *Sunne*, *Moone*, and *Starres*, caſt their beames euery way into an orbicular forme: ſo this Magneticall vigour caſts it ſelfe abroad not only from the center toward the *ſuperficies*, but from the *ſuperficies* outward into the *Aire* or *Water*, where this magneticall body is placed, and ſo makes vp a Spheare; but yet with this difference, that if the body bee meere and perfectly Sphericall, the Orbe of the magneticall vertue will end in a perfect Speare, as wee ſee the magnet G to confine his vertue

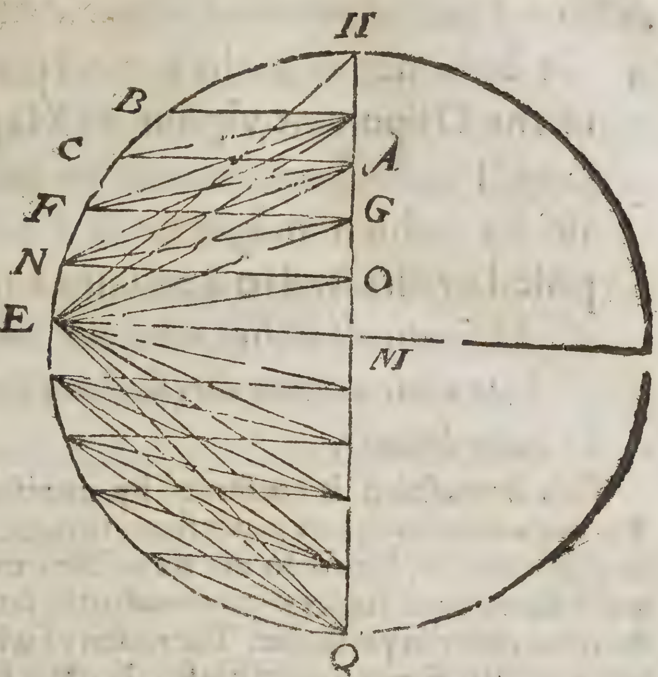


within the Circle B F. But if it be a ſquare, or any other figure not Sphericall, it imitates a Spheare as neere as the body will ſuffer, in that it ſpreades it ſelfe euery-where from the center by right lines; yet will it be confined in a ſquare figure correſpondent to the body, whence it proceeds, as we ſee the vertue of the *ſquare* magnet *A*, to caſt his beames into the ſquare figure L D.



3 *The motiue quality of the Magneticall body is ſtrongeſt of all in the Poles, in other parts by ſo much the ſtronger by how much theſe parts are ſituated neere the Poles.*

Wee ſuppoſe out of the principles of Magneticall Philoſophie, that a Magnet hath two *Poles*, whoſe vſe wee ſhall ſhew hereafter. Theſe *Poles* are found by experiment to haue more force and vigour in them then other parts, and all other parts to enioy more or leſſe force, by how much neerer or farther off they are ſituated to their Poles. The reaſon is aſcribed by theſe Writers to the diſpoſition of the *Magneticall* vigour in the body of the Load-ſtone, as ſhall appeare by this figure following in *Gilbert*, expreſſing the great *Magneticall* Body of the earth. Let the Sphericall *ſuperficies* of it bee H Q E; the Pole E, the Center M: H Q the *plaine* of the Equinoctiall; from euery point of this Equinoctiall plaine, the vigour Magneticall is conueyed and extended to C F N E; and to euery point from C to E the Pole: but not towards the point B, ſo neither from



G towards C. The vigour is not ſtrengthned in the part F H G, from that which is G M F E; but F G H doth increaſe the vertue in H: ſo that there can ariſe no vigor ſo far from the *parallels* to the *Axel--tree* aboue the ſaid parallels, but internally from the parallels to the Pole. So wee ſee that from euery point of the *Equinoctiall* plaine, the force is deriued to the Pole E. But the point F hath only the vigour from G H, and the point N from O H: but the Pole E is corroborated and ſtrengthened from the whole plaine of the Equinoctiall H Q. Wherefore the vigour magneticall in this Pole is moſt eminent and remarkable, but in the middle ſpaces; as for example in F, the magneticall quality is ſo far ſtrengthened, as the portion of the Equinoctiall plaine H, can giue. But D^r *Ridley* in his late Magneticall Treatiſe, in the 6. Chapt. ſeemes to oppoſe this Demonſtration. For although hee acknowledgeth that the vigour is ſtrongeſt of all in the Poles; yet (ſaith hee) if tryall bee made what the Pole will take perpendicularly; and alſo what the parts aboue 34 degrees will lift vp, it will appeare to bee halfe aſmuch perpendicularly; ſo that the Pole doth not take vp as much, as this and the other part doth on the other ſide. But the deciſion of theſe differences I leaue to ſuch as are more experimentall then my ſelfe, being deſtitute of thoſe helpes and inſtruments which they enioy.

4 It behoues vs in the ſecond place to ſpeake of the Diſponent vigour of Magneticall bodies The Diſponent force we call, that facultie by which magneticall Bodies are diſpoſed or directed to a certaine ſite or poſition.

1 *Magneticall bodies moue not vncertainly, but haue their motions directed and conformed to certaine bounds.*

This Propoſition is confirmed by manifold experiments. For *magneticall* bodies are neuer found to moue vncertainly, and at all adventures, but conforme themſelues to certaine Poles; and make certaine angles *proportionall* to the *latitude*, as we ſhall ſhew hereafter in particular. The reaſon of which experiment wee can draw from no other cauſe, then the firſt inſtitution of Nature in all Naturall agents, which wee would haue directed to certaine ends, that nothing in her Common-wealth might ſeeme idle or vnneceſſary; wherefore ſhee giues all agents not only a *power* to worke their ends; but alſo ſhewes them the *way*, ſquares and regulates the meanes which direct vnto the end. No-where is this *directiue* power more remarkable, then in magneticall bodies, eſpecially in their *Direction* and *Variation*, motions treated of hereafter in place conuenient: to which for a further confirmation of the Theoreme, wee referre the Reader.

9 The Radicall facultie of the magneticall body being ſomewhat ſpoken of, aſwell in their motiue, as diſponent vertues. Wee are in the next place to ſpeake of the deriued motions, which ariſe out of theſe faculties.

6 Theſe motions magneticall are either *partiall*, or *totall.* The partiall wee call that by which the parts of the Earth are magnetically moued and conformed as well one to the other, as to the whole terreſtriall globe.

7 The magneticall partiall motions are *Coition*, *Direction*, *Variation*, and *Declination*. Magneticall Coition is that motion by which magneticall bodies are ioyned and apply themſelues one to the other.

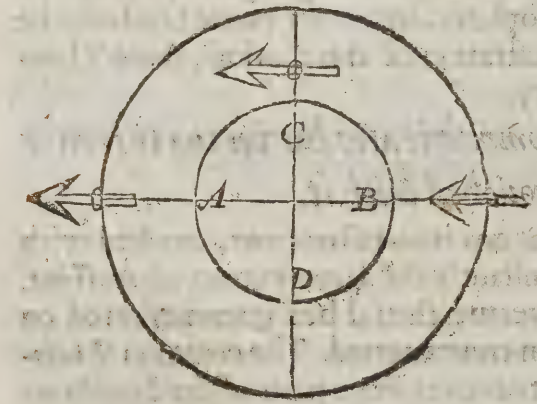
For the knowledge of this magneticall motion, we need goe no farther then the *Iron* and *Steele*, which wee ſhall obſerue to moue unto the Load-ſtone, and cleaue vnto it, if ſo be it bee placed within the Spheare of his vertue. This motion is commonly called *Attraction*, but improperly, as is obſerued by D. *Gilbert*. 1 Becauſe *Attraction* ſeemes to ſuppoſe an externall force or violence, by which one thing is carryed and moued vnto another: but the *Coition* is meerely naturall, as proceeding from the internall forme of both the bodies. 2 Attraction ſuppoſeth the force of mouing to bee onely in the one party, and the other to bee meerely paſſiue, and not actiuely concurring to this motion; whereas in the magneticall coition, both parts are mutually inclined by nature to meet and ioyne themſelues one to the other. Not that the force of motion in both parts is alwayes equall: becauſe one magneticall body is greater and ſtronger then the other, and then the one part ſeemes to ſtand ſtill and draw the other vnto it, although there bee in this part ſo reſting an inclination to the other; which mutuall inclination of coniunction in magnets, we may eaſily ſee in two magnets of equall quantity and vertue, which being ſet at a conuenient diſtance, will ſo moue, that they will meet in the mid-way. Some haue gone about to parallell this *Attractiue* force of the Load-ſtone with the *Attractiue* force of *Ieat* or *Amber*, which wee ſee by a naturall vertue to draw vnto it ſelfe little ſtrawes, and other ſuch like matter. But hee that truely vnderſtands the nature of a magneticall body, ſhall finde a great diſparity: Firſt, becauſe the Ieat or Amber which are compriſed vnder the name of *Electricall* bodies, drawes vnto it by reaſon of his *Matter*: whereas otherwiſe the cauſe of the *Magneticall Coition* is to bee ſought in the *forme*, as being too ſubtile a thing to ſpring from a materiall ſubſtance. Secondly, *Electricall* bodies draw and attract not without rubbing and ſtirring vp of the matter firſt; and preſently faile, if any vapour or thicke body ſhould be interpoſed. But in a magneticall motion wee find no ſuch matter, becauſe it requires no ſuch preparation or rubbing of the ſtone, nor is hindred by interpoſition of ſolid bodies, as wee proue in this place. Thirdly, the Load-ſtone moues and prouokes to motion nothing els but other magneticall bodies; but the *Electricall* will draw any little thing as ſtraw, haire, duſt, and ſuch like. Fourthly, the Magnet will lift a great waight according to his vertue and quantity; but Ieat the ſmalleſt and lighteſt things. Laſtly, the *Electricall* bodies, as *Gilbert* well confirmes by experiments, draw other bodies vnto them by reaſon of a *moiſt* effluence of vapours, which hath a quality of ioyning bodies together: as wee ſee by the example of two ſtickes in water at a certaine diſtance, which will commonly moue till they meet together. But the *magneticall coition* cannot bee other then an act of the magneticall forme. Of the cauſe of it many Philoſophers haue freely ſpent their vncertaine coniectures, rather out of a feare to bee eſteemed ignorant, then of confidence to be accounted learned. Moſt run vpon the forme of the mixt body, which growes from the compoſition of the foure Elements; but this opinion is very feeble, and cannot goe without crouches: for ſith all mixt formes grow out of the temperament and diſpoſition; they adde nothing to the thing compounded, but diuerſly modificate what was before in the ſimple Elements; it cannot bee imagined how ſuch an affection as this ſhould bee onely found in the magnet, and no other mixt body. Indeed we aſcribe this affection to the *forme* as the immediate cauſe; but by this *forme* we vnderſtand not the forme of the *mixture*, reſulting out of the mixture and temperature of the foure qualities; but the *magneticall* forme of all globous bodies, ſuch as are the *Sunne*, *Moone*, *Starres*, and this *Terreſtriall Spheare* whereon we liue, whoſe natures receiued the ſtampe in the firſt creation for the preſeruation of this integrity. Hee that ſhall ſeeke for the originall of all *formes* of this kinde in the *mixture* and *conſtitution* of the foure Elements, ſhall labour much, and finde little, and neither at laſt be able to content himſelfe, or inſtruct others; except wee ſuppoſe a man ſufficiently taught when hee heares ordinary matters expreſſed in *exoticke* and artificiall tearmes. For my owne part, I content my ſelfe with a rule of *Biel* the Schooleman; That when an immediate effect proceeds from an immediate cauſe, wee ought not to ſearch farther why ſuch a cauſe ſhould produce ſuch an effect. Euey man being demanded why the *fire* is *hot*, is ready to flye to the *forme* of *fire*, and alleage this as the cauſe: but ſhould hee inquire further, why the forme of fire ſhould bee the cauſe of heat, hee might perhaps puzzell a whole Academie of Philoſophers, and neuer proue himſelfe the wiſer. For the further illuſtration of this motion, theſe Theoremes will ſeeme neceſſary.

1 *The Magnet communicates his vertue to iron or ſteele if it be touched with it.*

Experience teacheth that any iron-inſtrument, touched with the Load-ſtone, receiues inſtantly the ſame vertue *Attractiue*. But the manner how this vertue ſhould bee communicated on ſo ſleight a touch, hath been controuerted. The common *Philoſophers* haue imagined, that certaine little parts of the Loadſtone are ſeparated from it in the touch, which cleauing to the iron or ſteele, cauſe this Attraction But that this vertue cannot be communicated by any *corporall* proceſſe, or any ſuch little parts cleauing to the iron, is not ſo eaſie to imagine: for firſt it ſeemes impoſſible, that with a bare touch, theſe parts ſhould bee ſeparated from the magnet, or at leaſt ſhould bee ſo faſt linked to the iron. Secondly, theſe parts being ſo little and inſenſible, cannot haue ſo much vigour as wee ſee an Iron will haue at the touch of the Load-ſtone. Thirdly, the Loadſtone can worke vpon the iron notwithſtanding any body interpoſed, which is an euident ſigne that the iron it ſelfe is of a magneticall temper. Wherefore to ſhew a reaſon of this effect, we ſay; That *Iron* is a mettall excocted out of the Load-ſtone; which albeit it retaine in it ſelfe the vertue of the Load-ſtone, yet by reaſon of the liquefaction, is altogether languiſhing, and as it were buried; but vpon touch of a Load-ſtone, is ſtirred vp to his former vigour: for the magnet inſinuats his *Incorporeall* influence into the *iron*; and ſo rectifies and animates that force which was almoſt dead.

2 *The magneticall Coiton is ſtrongeſt of all in the Poles.*

This may eaſily bee demonſtrated by an experiment: for if the iron needle which is propoſed to bee *Attracted*, and the *Poles* and *Center* be placed in the ſame right line; then this *Coition* will be to a *perpendicular*, as in A and B, to wit, the *Poles* in the Diagramme: but in the middle ſpace they will obliquely reſpect and point: and by how much farther off from the *Pole* it is, by ſo much is this vertue weaker: but in the *Equator* it ſelfe it becomes meerely *parallell* without any inclination at all. To know in what proportion this force is increaſed or weakened, we muſt put another ground; That the force of this coition is increaſed *proportionally* as the chords of a circle: for by how much the leaſt chorde in a circle differs from the *Diameter*, ſo much the forces *Attractiue* differ from themſelues. For ſith the *Attraction* is a Coition of one body with another, and magneticall bodies are carried by a *conuertible* nature: it comes to paſſe that a line drawne from one Pole to another in the diameter, directly



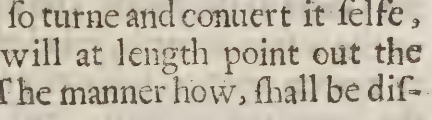
ly meetes with the body, but in other places leſſe, ſo that the leſſe it is conuerted to the body, the leſſe and weaker will bee the coition.

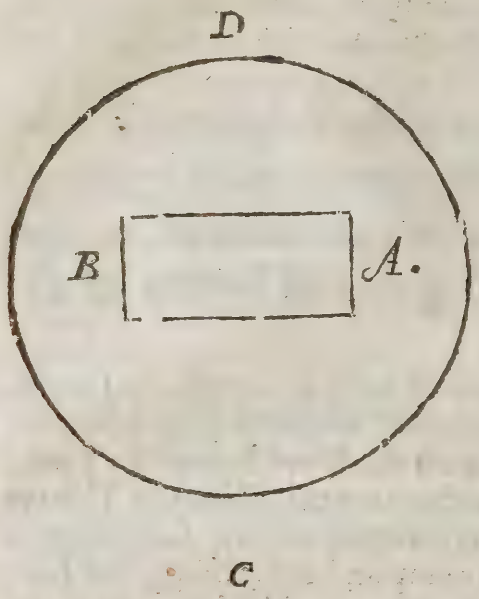
8 So much bee ſpoken of the magneticall *Coition*: It followes that wee ſpeake of Magneticall *Direction*, which is a naturall conuerſion and conformity of the magneticall bodies to the Poles of the Earth.

It is manifeſt that a magneticall body ſo ſeated, that it can moue without any impediment, will turne it ſelfe in ſuch wiſe, that the one Pole of it will reſpect the *North* Pole of the Earth, the other the *South*, which motion wee call *Direction*. This we may plainely ſee in a Marriners compaſſe, whoſe *Lilly* alwayes reſpects the *North* point. If a compaſſe bee wanting, the ſame may bee ſhewed in a little *corken-boate*, which being put in the water with a *load-ſtone* in it, will ſo turne and conuert it ſelfe, that the Poles of the Load-ſtone will at length point out the Poles of the *Terreſtriall* Globe. The manner how, ſhall be diſcloſed in theſe Theoremes.

1 *The South part of the Load-ſtone turnes to the North, and the North part to the South.*

To confirme this aſſertion, ſome haue produced this experiment. Let there bee cut out of a rocke of *Load-ſtone*, a *Magnet* of reaſonable quantity. Let the two poles both *North* and *South* bee marked out in the Load-ſtone, the manner of which, wee ſhall perhaps teach hereafter: then let it be put in a corken little boat on the water, ſo that it may freely float hither & thither: It will be euident that that part which in the rocke or Mine pointed *Northward*, will reſpect the South, and contrarywiſe the *South* part will reſpect the *North*; as wee may ſee in this figure: Let the *Magnet* as it is continuated with the Mine or Globe of the Earth be A B, ſo that A ſhall be in the *North* pole

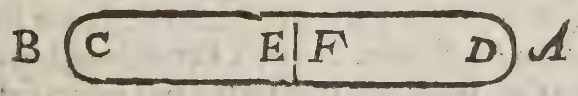


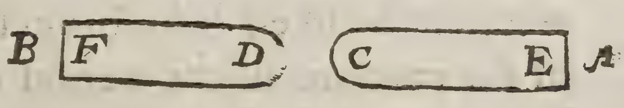


pole, B the *South*-Pole. Let this Load-ſtone be cut out of this rocke or Mine, & placed on the water in a little timber boat, which ſhall be CD: we ſhall find that this little diſh or boat will turne it ſelfe ſo long, vntill the *Northpart* A, be turned to the *Southpart* B: and on the other part, the *Southpart* B, be conuerted to the *Northpart* A: and this cõformity would the whole rock of Load-ſtone claime, if it were diuided and ſeparated from the Globe of the Earth. The reaſon why the magnet in the boat on the water, turneth, windeth, and ſeateth it ſelfe to a contrary motion to that it primarily receiued, whiles it was ioyned to the bowels of the Earth, and vnited to the body of the great Magnet, is; becauſe euery part of a Load-ſtone being ſeparated from the whole, whereof it is a part, becomes of it ſelfe a perfect, compleat, magneticall body, (as we may ſay) a *little Earth*, hauing all the properties of the great Globe, as *Poles*, *Meridians*, *Æquators*, *&c.* And therefore according to the nature of magneticall vnion, ſpoken of in our next Theoreme, will in no wiſe endure to ſettle it ſelfe as it did before; but deemes it a thing more naturall, and of more perfection, to turne his aſpect a contrary way, to that which he inioyed at his firſt conſtitution. Here may we note a great errour of *Gemma Friſius*, who in his corollary vpon the 15 Chap. of his *Coſmographicall* Comment on *P. Appian*, affirmes; that the Needle magnetically effected, would on this ſide the *Æquator*, reſpect the *North-pole*; but being paſt the Line, would ſtraight-way turne about, and point to the *Southpole*: An errour (as M^{r} *Hues* ſaith) vnworthy ſo great a Mathematician. But *Gemma Friſius* in ſome ſort, may be excuſed; for as much as the grounds of magneticall Philoſophy, were in his time either not diſcouered, or moſt vnperfectly knowne, and the vncertaine relations of Nauigators were reputed the beſt Arguments: and how eaſie a matter it is for a Trauailer in this ſort to deceiue a Scholler, who out of his reading and experience can ſhew nothing to the contrary, let euery man iudge.

2 *This contrary motion here ſpoken of, is the iuſt confluxe and conformity of ſuch bodies to magneticall vnion.*

This is demonſtrated by *Gilbert* in this manner. Let the whole magneticall body be C D, then C will turne to the North of the Earth B, and D vnto the South part A. Let this magnet bee cut in twaine by the middle line or *Æquator*, and the point E will tend to A, and the part F, will direct it ſelfe to B: for as in the whole, ſo in the parts diuided, nature deſires the vnion of theſe bodies. The end E willingly accords with F; but E will not willingly ioyne it ſelfe with D, nor F with C, for then it would haue C, againſt its nature, to moue toward A the South, or D in B, which is the South. Separate the ſtone in the place of diuiſion, and turne C to D, and they will conueniently agree and accord; For D will turne it ſelfe to the South as before, and C to the North; and E and F ioynt parts in the minerall or rocke, will now bee moſt ſundred. For theſe magneticall parts concurre and meet together not by any affinity of *matter*, but receiue all their motion and inclination from the *forme*; ſo that the limits, whether ioynt or diuided, are directed magnetically to the Poles of the Earth, in the ſame manner, as in the diuided body.





8 *If any part Southward of the magneticall body bee torne away or diminiſhed, ſo much ſhall bee alſo diminiſhed of the North-part; and contrariwiſe if any part bee taken away in the North-part, ſo much ſhall the vertue of the South part be diminished.*

The reaſon is, becauſe the Magnet hauing eminently in it the circles which are in the Earth, is ſeparated or diuided by a middle line or *Æquator*, from which middle ſpace the vertues are conueyed toward either Pole, as we haue before ſhewed. Now any part being taken away from the North or South part, this Æquator or middle line is remoued from his former place into the midſt of the portion which is left, and ſo conſequently both parts are leſſe then before: For although theſe two ends ſeeme oppoſite, yet is one comforted and increaſed by the other.

9 Of the motions of Coition and Direction wee haue handled. It followes that we ſpeake of the motions of the ſecond order, to wit, *Variation*, and *Declination*.

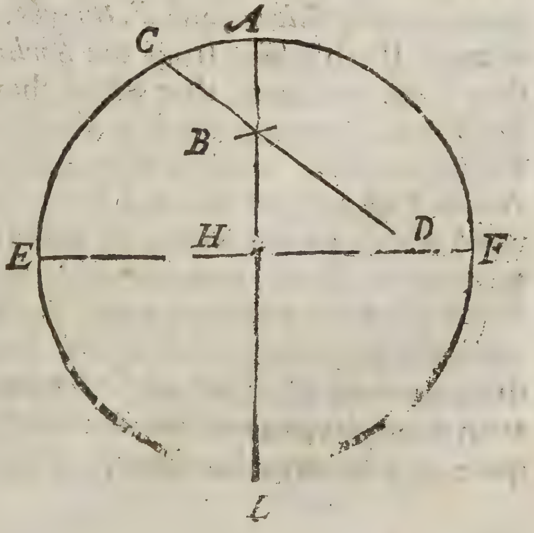
10 Variation is the deuiation or turning aſide of the directory Magneticall needle from the true point of North, or the true Meridian towards Eaſt or Weſt.

In the diſcourſe immediatly going before, hauing treated of the magneticall body, wee haue imagined it to bee true, and pointing out the true North and South points of the Terreſtriall Globe; which certainely would bee ſo, if the ſubſtance of the Earthly Globe were in all parts and places alike, equally partaking the Magneticall vertue, as ſome round Load-ſtone; neither ſhould wee find any variation or deuiation at all from the true Meridian of the Earth: But becauſe the Terreſtriall Globe is found by Nauigatours to bee vnequally mixed with many materialls, which differ from the magneticall ſubſtance, as furniſhed with rockie hills, or large valleyes, continents, & Ilands, ſome places adorned with ſtore of iron Mimes, rocks of Loadſtone, ſome altogether naked and deſtitute of theſe implements; it muſt needs fall out, that the magneticall needle and compaſſe directed and conformed by the Magneticall nature of the Earth, cannot alwayes ſet themſelues vpon the true Meridian, that paſſeth right along to the *Poles* of the Terreſtriall Globe; but is forced and diuerted toward ſome eminent and vigorous magneticall part; whereby the *Meridian* pointed out by the magnet, muſt needes varie and decline from the true *Meridian* of the Earth, certaine parts or degrees in the *Horizontall* circle; which diuerſion wee call the *Variation* of the compaſſe: ſo that variation, ſo far as it is obſerued by the compaſſe, is defined to bee an *Arch* of the *Horizon*, intercepted betwixt the common interſection with the true *Meridian*, and his *deuiation*. This effect proceeding from the Inequality of magneticall vertue ſcattered in the Earth, ſome haue aſcribed to certaine Rockes or mountaines of Loadſtone, diſtant ſome degrees from the true Pole of the World; which rockes they haue termed the Pole of the Loadſtone, as that whereunto the magnet ſhould diſpoſe and conforme it ſelfe: which conceite long agoe inuented, was afterward inlarged and trimmed ouer by *Fracaſtorius*. But this opinion is a meere coniecture, without ground: for what Nauigatours could hee euer produce that were eye-witneſſes of this myſterie? or how can he induce any iudicious man to beleeue that, which himſelfe, nor any to his knowledge euer ſaw? The relation that the Frier of *Noruegia* makes of the Frier of *Oxfords* diſcouery, recorded by *Iames Cnoien* in the booke of his Trauels, where he ſpeaks of theſe matters, is commonly reiected as fabulous and ridiculous; for had there beene any ſuch matter, it is likely he would haue left ſome monuments of it in the records of his owne Vniuerſity, rather then to haue communicated it to a friend as farre off as *Noruegia*. Moreouer the diſproportion in the degrees of *variation* in places of equall diſtance, will eaſily correct this errour, as we ſhall ſhew in due places.

place. More vaine and friuolous are all the opinions ofǝɥʇors concerning this magneticall variation: as that of *Corteſius*, of a certaine motiue vertue or power without the Heauen; that of *Marſilius Ficinus* of a ſtarre in the *Beare*; that of *Petrus Peregrinus*, of the Pole of the world; that of *Cardan*, of the riſing of a ſtarre in the taile of the Beare; that of *Beſtardus Gallus*, of the Pole of the *Zodiacke*; that of *Liuius Sanutus*, of a certaine magneticall Meridian; of *Francis Maurolycus*, of a magneticall Iland; of *Scaliger*, of the heauen and mountaines; of *Robert Norman*, of a reſpectiue point or place: All which Writers ſeeking the cauſe of this variation, haue found it no further off then their owne fancies. More probable by farre, and conſonant to experience, ſhall wee finde their opinion, which would haue the cauſe of this variation be in the Inequality of the magneticall Eminencies ſcattered in the Earth. This Inequality may bee perceiued to bee twofold. 1 in that ſome parts of the Earth haue the magneticall minerals more then other parts; for as much as the *Superficies* of ſome parts is ſolid Earth, as in great Continents: 2, Becauſe although the whole Globe of the Earth is ſuppoſed to be magneticall, eſpecially in the Internall and profound parts: yet the magneticall vertue belonging to thoſe parts, is not alwayes ſo vigorous and eminent as in ſome other parts: as wee ſee one Load-ſtone to be ſtronger or weaker then another in vertue and power: but of thoſe two, the former is more remarkable, which may bee ſhewed by experience of ſuch as haue ſailed along many ſeacoa-ſtes: for if a ſea-iourney bee made from the ſhore of *Guinea* by *Cape Verde* by the *Canarie* Ilands, the bounds of the Kingdome of *Morocco*, from thence by the confines of *Spaine, France, England, Belgia, Germany, Denmarke, Noruegia*: we ſhall find toward the Eaſt, great and ample Continents; but contrarywiſe in the Weſt a huge & vaſt Ocean: which is a reaſon that the magneticall needle will vary from the true point of the *North*, and inclines rather to the *Eaſt*; becauſe it is more probable that theſe Continents and Lands ſhould partake more of this magneticall minerall, then the parts couered with the Sea, in which theſe magneticall bodies may bee ſcarcer, or at the leaſt deeper buried, and not ſo forceable. On the contrary part, if wee ſaile by the *American* coaſts, we ſhall rather find the *variation* to be Weſtward: as for example, if a voyage be made from the confines of *Terra Florida*, by *Virginia*, *Norumbega*, and ſo Northward, becauſe the land butteth on the Weſt: but in the middle ſpaces, neere the *Canary* Ilands, the *directory* needle reſpects the true Poles of the Terreſtriall Globe, or at leaſt ſhewes very little variation. Not for the agreement of the *Magneticall* Meridian of that place with the true by reaſon of the Rocke of Load-ſtone, as ſome haue imagined: becauſe in the ſame *Meridian* paſſing by *Braſile*, it fals out farre otherwiſe: but rather becauſe of the Terreſtriall Continents on both ſides, which almoſt diuide the Magneticall vigour, ſo that the Magneticall needle is not forced one way more then another; the manner whereof wee ſhall finde in *D. Gilbert* expreſſed in an apt figure, to whom for further ſatisfaction I referre the Reader.

1 *The Magneticall variation hath no certaine Poles in the Terreſtriall Globe.*

It is but a common receiued errour (as we haue mentioned) that there is a certaine Rocke or Pole of Load-ſtone, ſome degrees diſtant from the true Pole of the world, which the Magneticall needle in it's *variation* ſhould reſpect. This Pole they haue imagined to be in the ſame *Meridian* with that which paſſeth by the *Azores*, whence they haue laboured to ſhew the reaſon why the Compaſſe ſhould not vary in that place: which they explaine by this Figure. Let there be a circle deſcribing the Spheare, E A F, the Horizon E F, the Articke Pole A, the Antarticke L. The Pole or Rocke of Loadſtone placed



placed out of the Pole of the Earth B. Let there bee placed a magneticall *directory* needle in H; it will (according to their aſſertion) tend to the point B, by the magneticall Meridian H B; which becauſe it concurres with the true Meridian B A, or H A, there will be no variation at all, but a true direction to the North Pole of the Earth. But let this magneticall needle be placed in the point D, it is certaine, according to this opinion, that it will tend to the Pole of the Loadſtone B, by the magneticall Meridian D B. Wherefore it will not point out the Pole of the Earth A, but rather the point C; becauſe theſe two Meridians come not into one and the ſelfe-ſame. Hence they haue laboured with more hope then ſucceſſe, to find out the *longitude* of any part of the Earth, without any obſeruation of the Heauens: which I confeſſe might eaſily be effected, if this coniecture might ſtand with true obſeruation. But how farre this conceit ſwarues from the experience of Nauigatours, one or two inſtances will ſerue to demonſtrate. For if the *variation* had any ſuch certaine poles as they imagine, then would the *Arch* of *variation* bee increaſed or diminiſhed proportionally according to the diſtance of the places. As for example; If in the compaſſe of an hundred miles, the Compaſſe were varied one degree, then in the next hundred miles it would vary another degree, which would make two degrees. But this hath often been proued otherwiſe by diuerſe experiments of Nauigations, mentioned by *Gilbert*, and *F. Wright*. I will only produce one or two. If a ſhip ſaile from the *Sorlinges* to *New-found-land*, they haue obſerued, that when they come ſo farre as to finde the *Compaſſe* to point directly *North*, without any variation at all; then paſſing onward, there will bee a *variation* toward the *North-Eaſt*, but obſcure and little: then afterward will the *Arch* of this *variation* increaſe with like ſpace in a greater proportion, vntill they approach neere the *Continent*, where they ſhall find a very great *variation*. Yet before they come aſhoare, this variation will decreaſe againe. From which one inſtance, if there were no other, we might conclude; That the *Arch* of variation is not alwaies *proportionable* to the *diſtance*: which granted, quite ouerthrowes that conceit of the Poles of variation. Beſide

ſide this, if there were two ſuch magneticall Poles, there can be but one common *Meridian*, paſſing by them and the Poles of the Earthly Globe. But by many obſeruations collected and obſerued by *Ed.Wright* and others, there ſhould be many magneticall *Meridians* paſſing by the Poles of the world: as in the Meridian about *Trinidado*, and *Barmudas*; the Meridian about the Weſtermoſt of the *Azores*: laſtly, the Meridian running amongſt the *Eaſt Indian* Ilands, a little beyond *Iaua Maior*, the magneticall and true Meridian muſt needs agree in one. Now for as much as all theſe magneticall Meridians paſſe by the Poles of the earth, there can no cauſe be aſſigned why the magneticall Poles ſhould bee ſaid to bee in one rather then another; and if in any, then in all. Whence it muſt needes follow, that as many magneticall Meridians as you haue to paſſe by the true Poles of the world; ſo many paire of magneticall Poles muſt you haue, which will be oppoſite to all reaſon and experience.

1 *The point of* Variation, *as of* Direction, *is only Reſpectiue, not Attractiue.*

It was ſuppoſed by the Ancients, that the *Direction* and *Variation* of the Loadſtone was cauſed by an *Attractiue* point, which drew and enforced the lilly of the Compaſſe that way: which errour tooke place from another common-receiued opinion, that all the other motions of the magnet were reduced to the *Attractiue* operation: but the errour was corrected by one *Robert Norman*, an Engliſh-man, who found this point to bee *Reſpectiue*, and no way *Attractiue*. Whoſe reaſon or demonſtration is not diſapproued by Dr *Gilbert*, although in other matters hee ſharply taxeth him. His experiment is thus. Let there be a round veſſell, as we haue deſcribed, ful of water; in the midle of this water-place an iron-wier, in a conuenient round corke, or boat, that it may ſwimme vpon the water, euen poyzed: let this iron-wire be firſt touched with the load-ſtone, that it may more ſtrongly ſhew the

the point of *variation*; let this point of variation be D, let this iron-wire reſt vpon the water in the corke for a certaine time; It is certainly true that this iron-wire in the cork, will not moue it ſelfe to the margent or brinke of the veſſell D, which certainly it would doe, if the point D were an attractiue point.

3 *The variation of euery place is conſtant and not variable.*

This hath beene ratified by the experience of Nauigatours, which in the ſelfe-ſame Regions haue neuer miſſed the true variation which they haue aſſigned them before. If any difference bee aſſigned in variation to the ſame Region, wee may impute it to their errour which obſerued it, ariſing either from want of skill, or conuenient inſtruments. Neither can this euer be changed, except ſome great deluge or diſſolution happen of a great part of land, as *Plato* records of his *Atlanticke* Ilands.

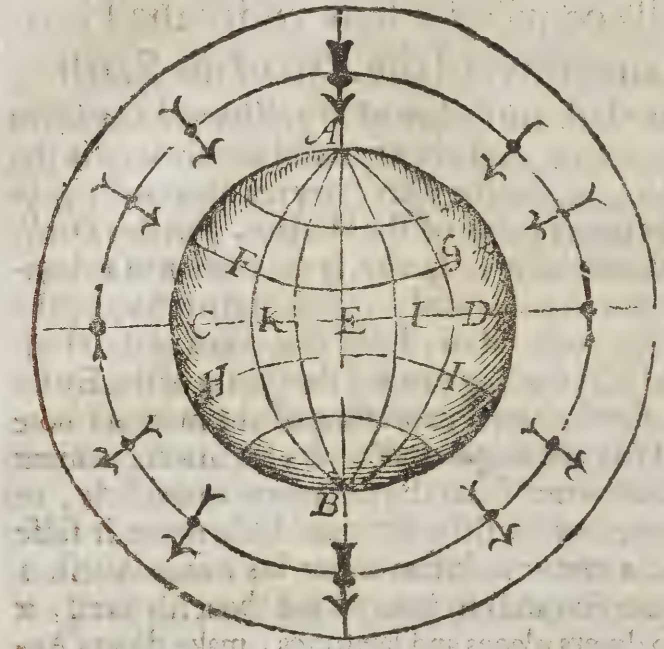
4 *The variation is greater in places neere the poles of the Earth.*

This proportion is not to be taken *vniuerſally*, but *commonly* for the moſt part; yet would it haue truth in all places, if all other things were correſpondent. It is obſerued that the *variation* is greater on the coaſts of *Norway*, and the *Low-countries*, then at *Morocco*, or *Guinea*. For at *Guinea* the magneticall needle inclines to the Eaſt, a *third* part of one *Rumbe* of the Compaſſe: In the Ilands of *Cape-Verde*, halfe; in the coaſts of *Morocco*, two third parts: In *England* at the mouth of *Thames*, according to the obſeruation of *D. Gilbert*, and *Ed. Wright*, though ſome deny it, one whole *Rumbe*; in *London* the chiefe city of it, eleuen degrees and more, which we alſo find, or thereabout, in *Oxford*. The reaſon is, becauſe the magneticall motiue vertue is ſtronger in the greater *latitude* increaſing towards the pole: and the large Regions of land lying toward the Pole, preuaile more then thoſe which are ſituate farther off.

12 Thus much for the Variation. The *Declination* is a magneticall motion, whereby the magneticall

ticall needle conuerts it ſelfe vnder the Horizontall plaine, toward the *Axis* of the Earth.

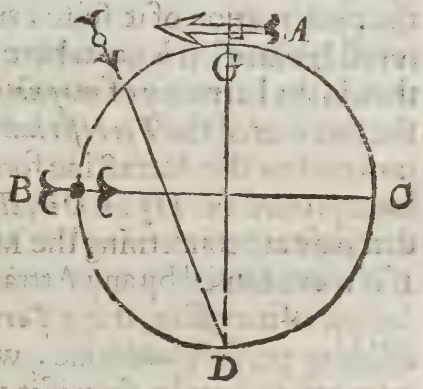
What wee haue hitherto ſpoken of *Direction* and *Variation* magneticall, was ſuch as might be expreſſed and ſhewed in the plaine of the Horizon, by the Directory needle equally poyzed, when it is ſet in any point of the Horizon. But this *Declination* whereof wee are now to ſpeake, is the motion of an iron-wire or needle, firſt equilibrated, and then ſtirred vp by the loadſtone, vpon his owne *Axis*, from that point of the Horizon, the other end of it tending toward the center of the Earth: where wee may, for the better expreſſing of the motion, note two things: 1 That the *magneticall* wier, ſet in a conuenient inſtrument, if it bee carried from the *Æquator* to the Pole, or from one Pole to another: will by little and little turne it ſelfe round, and make a circumuolution about his owne Axell. 2 That by this conuerſion and circumuolution about his axell, it will according to diuers places and latitudes, make diuers Angles in diuers places; both which are included in this motion of Declination, and are warranted by experience made by an *Inclinatory* needle applyed to a *Terrella*, or round Loadſtone; as alſo by the experience of *Nauigations* on the great Spheare of the *Earth*. To explaine which motion, there are curious inſtruments formed and inuented by *Dr Gilbert*, and *Dr Ridley*, which the curious in this kinde, to their greater ſatisfaction may peruſe. In the meane time wee will here content our ſelues with one figure following, borrowed from their more copious inuention; wherein we ſhall find enough to expreſſe the manner of this motion. In this Figure let ABCD be the *Terrella* or round magnet repreſenting the Spheare of the Earth: A the North-pole, B the South, AEB the Axell, CED the Æquator: AKB, and ALB the *Meridian* circles meeting in the Pole. AC, and BD the Meridian or right Horizon, hauing in it the two Poles: FG and HI two *parallels*. The Loadſtone being thus deſigned in his outward Poles, as it is according to his naturall eminency ſtored inwardly: Let the Needles bee placed (being before touched) on the Limbe ouer-againſt the Poles,



AB, and we ſhall obſerue them to reſpect them *directly*, cócurring in one ſtraight line with the *Axell* of the Earth: Then ſet the ſame Needles in the Limbe ouer-againſt the *Æquator* CD, and they will diſpoſe & ſettle themſelues in a *parallell* ſite to the Axell of the Earth, and incline neither to one Pole or other: Hence may bee collected by plaine conſequence, that there is a ſemi-circle betwixt each of theſe foure needles. Now to finde the *quadrants* of theſe, apply Needles in the Limbe at 23 degrees diſtant from the Æquator on each ſide of him, and they will make right angles with the axell of the ſame, where theſe eight needles haue 8 quadrants between them, that is, foure ſemi-circles which will make two whole circles, one on each ſide of the *Æquator*. But if you place the needles in the midſt betweene the *Æquator* and the *Poles*, they will reſpect the axell but *obliquely* as in all other parts, except in the eight places before-mentioned. From hence may we learne what we propoſed: firſt that the *Declination* is a conuerſion of the *magneticall* wire or needle vpon its owne axell: ſecondly, that this wire by this motion ſo excited, if it bee moued on any *Meridian* North or South, will apply and conforme it ſelfe according to certaine angles, to the Axell of the Earth. Thirdly, there will ariſe this corollary, that the magneticall needle about the round Magnet, maketh two circles. Concerning this declination wee will inſert two eſpeciall *Theoremes.*

1 *The Declination is anſwerable to the latitude not in* Equality of degrees , *but in* proportion.

It is manifeſt out of that which wee haue ſpoken, that this motion of *Declination* ſuppoſeth two motions ; The one of *Conuerſion* , whereby the needle is turned round on his owne *Axis* : The other a *Progreſſiue* motion , whereby the center it ſelfe of the *Inclinatory* Needle is carryed forward vpon a Meridian from North to South , or contrarywiſe. Theſe two motions ſuppoſed to proceed and beginne together , cannot poſſibly meet in ſuch Equality , as that the degrees of *Declination* directly anſwer in Equality to the degrees of *latitude* , which is demonſtrated by this Figure here inſerted. Let the magneticall body bee A , this body while it ſhall bee moued aboue the Earth from G D the *Equinoctiall* toward the Pole B , will bee turned vpon his owne Center, and in the middle of the progreſſe of the center from the Equator to the Pole B , it will be directed to the Equator D in the middle betweene the two Poles. Therefore the middle muſt needes turne faſter on his owne center , then the center it ſelfe turned forward ; that by this conuerſion it ſhould directly reſpect the point D : wherefore this motion will bee ſwifter in the firſt degrees, to wit, from A to L, but in the latter it will be ſlower from L to B , in reſpect of the Æquator from D to C. Now if the *Declination* were equall to the latitude , then the magneticall wier ſhould obſerue and follow the facultie and peculiar vertue of the center of an *operatiue* and attractiue point. But reaſon & experience teacheth , that it obſerueth the whole body and maſſe , with all the externall limits of the Earth and Load-ſtone ; the whole vertues and forces of both concurring ,



aſwell of the conuertible wier, as of the whole Earth: Neuertheleſſe from this experiment the skilfull in Magneticall Philoſophie, haue found out a proportion whereby the latitude of places may inſtrumentally bee found out by the degrees of *Declination*.

2. *The* Magneticall Declination *is cauſed not of the* Attractiue, *but of the* Diſponent *and* Conuerſiue *vertue of the Earth.*

There is nothing more admirable in Nature, then the order and ſituation of all bodies in their places, moſt conuenient for each ones conſeruation. For the obtaining of which harmony, (as wee haue taught in our ſecond Chapter) it is endowed with a proper *motion* conuenient, to place and ſeat it ſelfe, both for the preſeruation of it ſelfe, and the whole Vniuerſe. This naturall Inclination is no-where more eminent and conſpicuous, then in the harmony of *magneticall* bodies, which are (as it were) the ſinewes of the *Terreſtriall* Globe. Theſe motions ſome haue imputed to the Attractiue force, but very erroneouſly, as wee haue proued already of *Direction* and *Variation*, and ſhall here demonſtrate concerning the Magneticall *Declination*: for firſt, if it were cauſed by any Attractiue force approching it would follow of neceſſity, that a *Terrella* or round Spheare; made of a ſolide or perfect loadſtone, would more turne and wreſt the magneticall needle, then if it were made of a weaker and more imperfect ſubſtance: alſo that a needle touched with a ſtronger ſtone, ſhould ſhew a greater Declination then that touched with a weaker. But experience hath found the contrary, becauſe the Declination will bee all one, bee the ſtone ſtronger or weaker. Moreouer a Loadſtone armed with an Iron-Noſe (as they tearme it) put vpon the Meridian in any latitude, will not lift vp a piece of iron more perpendicularly, then if it were naked and vncouered, although it will lift vp much greater and heauier waights; which experiments are ſufficient to confirme our aſſertion, that this Declination is cauſed only by the diſponent and conuerſiue vertue of this Terreſtriall Globe.

3 *The magneticall Declination hath a variation.*

That in the magneticall *Direction* there is found an Irregularity or variation, hath beene ſufficiently warranted by Artificers Inſtruments. The like Irregularity is in the motion of Declination, which makes magneticall Inſtruments and experiments more ſubiect to errour and imperfection. The *variation* of Declination is defined to bee an Arch of the Magneticall meridian betwixt the true and apparent Declination. The cauſe hereof is onely to bee ſought in the vnequall temper of magneticall parts in the Earth. For as in the Direction, magneticall bodies are drawne and wreſted from the true meridian, by the eminent and more vigorous force of the Earth, one ſide ouerruling the other: ſo the magneticall needle (the conuerſion ſomewhat increaſed) declines ſometimes beyond his naturall ſite and conformity. This may cauſe an errour, but not of any great moment: ſometimes when there is no variation or Direction at all in the Horizon, there may bee a Variation or Declination; to wit, either when the more eminent and ſtronger parts of the Earth are placed iuſt vnder the Meridian; or when theſe parts are more impotent then the generall nature requireth; or els when the Magneticall vigour is too much increaſed on one ſide, and diminiſhed on the other as wee may behold in the vaſt Ocean.

CHAP. IIII.

Of the Totall motions Magneticall.

1 HAuing paſſed the Partiall motions magneticall, wee are next to ſpeake of the Totall motions, which more neerely agree to the whole Earth, ſuch as are the

Verticitie and Reuolution.

2 The *Verticity* is that whereby the Poles of the earthly Spheare, conforme and ſettle themſelues vnto the Poles of the Heauen.

1 *The Spheare of the Earth by her* Magneticall *vigour, is moſt firmely ſeated on her Axell; whoſe Ends or Poles reſpect alwayes the ſame points in the Heauens, without Alteration.*

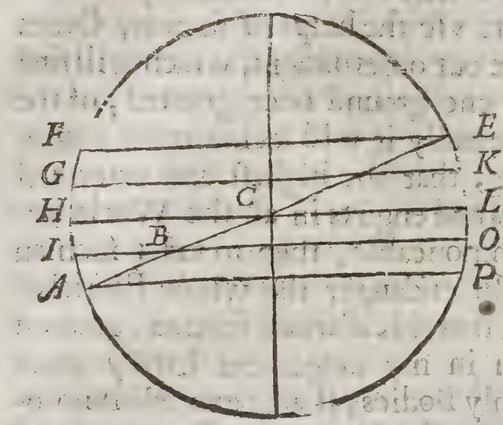
That which in a little Magnet or Load-ſtone is called *Direction*, in the vaſt Globe of the Earth is called *Verticity*. To vnderſtand which, wee muſt conceite, that the Earth hath naturally two Poles, vnto which the *meridionall* parts doe direct not only magneticall bodies neere the Earth, but her owne maſſie ſituation and firmeneſſe; and ſettles her ſelfe ſo ſtrongly by her magneticall vertue paſſing through the Meridionall parts to the Poles, as if ſhee were tied by many ſtrong cables to two *Herculean* pillars, not ſubiect to alteration: And if it ſhould happen by any ſupernaturall power, that the ſituation could bee changed: ſhee would (no doubt) by her magneticall vigour and verticity, returne and reſtore her ſelfe to her former *poſition*, as all magneticall needles will doe to their proper ſite and conformity Of this Verticity needes no more to bee ſpoken, then hath been already ſaid in the point of *Direction*; becauſe the former is a repreſentation of the latter, and depends on the ſame demonſtration. Out of which ground wee may euidently conclude, that the *Axell* of the Terreſtriall Globe remaynes alwayes inuariable: By which we may refute the opinion of *Dominicus Maria*, who was Maſter to *Copernicus*; who out of certaine vnperfect obſeruations, was induced to beleeue that the Poles of the World were changed from their true and naturall ſituation: I haue obſerued (ſaith hee) looking on *Ptolomies* Geographie, that the eleuation of the Pole Articke almoſt in all Regions, as it is put downe in *Ptolomie*, differs and failes in one degree and ten minutes from that which wee finde in our time: which cannot bee aſcribed to the errour of the table, becauſe it is not probable that the whole ſeries ſhould bee depraued according to this equality of number. Wherefore it muſt follow of neceſſity, that the North pole ſhould bee moued toward the verticall circle: which myſtery not knowne of the Ancients for want of former obſeruations, hath ſhewed it ſelfe to our times, being inriched not only with their, but our owne experiments. According to this opinion of *Dominicus Maria*, the North pole ſhould bee eleuated higher then it was, and the Latitudes of Regions ſhould bee greater then they were. But to this opinion we will oppoſe the opinion of *Stadius*, which holdeth that the latitudes of Regions haue beene decreaſed and diminiſhed from that they haue had in *Ptolomie*, without any ſuch regular Increment or Decrement; which hee labours to confirme by many obſeruations: as for example, the latitude of *Rome* as it is ſet downe by *Ptolomie* is 41 degrees $\frac{2}{3}$ parts: but by newer obſeruation it is found to be 41 degrees, $\frac{1}{3}$ parts: out of which wee may well coniecture, that *Ptolomies* obſeruations were not alwayes exactly true, being for a great part ſuch as hee had receaued from *Hipparchus*, and not examined himſelfe: as may bee ſeene in the latitude of many Citties in *Europe*, where hee miſſed ſometimes 2, ſometimes 3 degrees. Wherefore no iudicious Geographer would vpon ſuch imperfect obſeruations and vncertaine coniectures bring in a new motion of the earth to ouerthrow that magneticall Harmony and conſiſtency corroborated with ſo many and ſure demonſtrations. This may ſerue to anſwer a certaine Tenent of *Vaſquez* the Ieſuite, and ſome others; who imagine the Center, and by conſequence the Pole of the Earth, to bee moued vp and downe by a certaine motion of Liberation. The argument on which they would ground their aſſertion, is taken from the Center of Grauity, in this manner. The whole maſſe of the earth (ſay they) is ſo ſetled about the Center, that it is equally poized: that is as much as to ſay, that the parts are indowed with an equall waight. Now ſuch Bodies as are ſo equally poized by the addition or diminution of any part on either ſide, will bee ſtraight-way turned from that ſite which they had before in *Æquilibrio:* as is dayly confirmed by experience of a Ballance, and other ſuch mechanicke inſtruments. Wherefore in the Terreſtriall ſpheare, the Center and Poles ſhould in this wiſe bee changed and altered, and the whole ſuffer a kinde of ſtarting or Libration. For it is manifeſt by dayly obſeruation, that ſome things in the ſuperficies of the earth are fallen off, and carried into another place: as Men, Beaſts, and Birds, which moue from one place vnto another. Nothing is here of more moment then the motion of the Sea, by which the parts of the water by continuall ebbing and flowing, ſuffer ſuch a ſenſible change of Addition and Diminution, that no man can imagine how the parts of the Earth about the Center ſhould alwayes bee equally counterpoyzed, but the waight on one ſide ſhould bee predominant vnto the other, and ſo driue the Center from his former place. This Argument *Blancanus*, another late Ieſuite, leaues altogether vnanſwered; *De Mundi fabr. part. 3. cap. 2.* either imagining it too ſtrong, or out of a combined faction of their owne ſociety, vnwilling to contradict his fellow. And indeed ſhould wee conſider the ſpheare of the earth, no otherwiſe then according to his Elementary conſtitution: this reaſon would hardly admit of a ſolid anſwer: For howſoeuer in the vaſt frame of the Earth, the addition or ſubtraction of ſome parts would make but an inſenſible difference: yet can it not bee denied, but the leaſt waight whatſoeuer added or ſubtracted, would turne it from its *Equall-poyze*: Neuertheleſſe, this I hold too abſurd for a Chriſtian to beleeue, for as much as it Pſal. 104. contradicts the ſenſe of holy Scriptures, which auerre the earth to bee ſo ſetled on her foundation, that ſhee ſhould not at any time bee remoued, or ſhaken: which motion (as ſhall bee proued in the ſecond Theoreme) I take to bee vnderſtood of ſuch a Trepidation of the Center and the Poles, which by a metaphor are tearmed the foundation of the earth, and not of the circular motion, as ſome haue laboured to wreſt it. Wherefore nothing is here left vs to ſatisfie this doubt: but to haue recourſe to his magneticall verticity, whereby the poles of the Earth endowed with a magneticall vigor, and ouerſwaying the elementary ponderoſity of the earthly parts, are (as it were) ſo faſt bound to reſpect the ſame points or poles in the Heauens, that the Center can no wayes bee ſhaken, or moued out of his place.

3 The Magneticall Reuolution is a motion by which the whole globe of the Earth is moued round.

Ariſtotle in his 1 booke *de cœlo* makes 3 kindes of ſimple motions, out of which hee labours to deduce the number of ſimple bodies. The firſt is the motion from the center, ſuch as is of Fire and Ayre, and all light bodies: the ſecond to the center, ſuch as is of Earth and Water; the third is round about the center or middle, which hee aſcribes to the Heauens: ſo that if this ground were true, the Earth could challenge to it ſelfe no other then the right motion; whereby the parts of it being ſeparated from the whole, returne to it againe. But this opinion although popular and plauſible, hath beene contradicted, as well by ancient Philoſophers as moderne: for by long experience and diligent obſeruation, they haue found the earth to bee endowed with a ſtar-like vigour, whereby ſhee may, hauing all her parts vnited together by reaſon of her grauity vnto the Center, and her place made ſure by her magneticall poles, moue naturally vpon her owne poles, at leaſt if ſo bee ſhee claime no other motion. This opinion firſt bloſomed (as farre as I can gather) in the Schoole of *Pythagoras*, was cheriſhed by *Heraclides Ponticus*, and *Ecphantus*, two famous *Pythagoreans*: to which afterward ioyned themſelues *Nicetus Syracuſanus*, and *Ariſtarchus Samius*; all which haue vndertaken to defend that the Earth moues circularly, and that this circumgyration of the Earth cauſeth the riſing and ſetting of the Sunne, as well as of other ſtarres, although in the manner they haue not expreſſed themſelues alike, hauing inioyed as yet ſcarce the firſt dawn of knowledge. But all this while Philoſophie contented her ſelfe with the acquaintance of a few choice friends, not daring to proſtitute her treaſures to popularity. But when it hapned in after times that ſhee was taught the language of the vulgar, and ſpake to the vnderſtanding of each mechanicke, ſhee ſoone contracted ſome ſtaines, and ſquared her ſelfe rather to pleaſe the moſt then the beſt. Thus the multitude as a vaſt torrent preuailed againſt the learned, and caſt into exile the inuentions of the *Ancients*, which their ignorance was readier to cenſure then vnderſtand. Yet were not the ſeeds of this Philoſophy quite extinct, but as forgotten for a time; vntill there aroſe *Copernicus*, a man of incomparable wit, who quickned and reuiued it, to his euerlaſting prayſe and our profit: I would not here be miſtaken, as though I ſtrongly apprehend theſe grounds, and reiect all the principles of our *Peripateticke* Philoſophie: I only inueigh againſt their preiudicate ignorance, which ready to licke vp the duſt vnder *Ariſtotles* feet with a ſupercilious looke contemne all other learning, as though no flowers of ſcience could grow in another garden. I confeſſe this opinion of the Earths circular motion to bee ſubiect to many and great exceptions, and oppoſed by ſtrong and waighty arguments drawn probably from the booke of God, the touch-ſtone of ſincere verity; yet I hold it too ſtrongly fortified to be inuaded by popular arguments drawn from ſeeming ſenſe, and bolſtered vp with names and authorities. For mine owne part, I confeſſe not abſolute ſubſcription to this opinion; yet could I not conueniently leaue it out, becauſe hauing vndertaken to inſert this Magneticall Tract; I would not willingly mangle it in any part, but ſhew it whole and intire to the view of the iudicious; who herein may vſe their Philoſophicall liberty, to imbrace or reiect what they pleaſe. If theſe grounds ſeeme true, they will finde acceptance; if otherwiſe, it cannot indamage Truth to know her aduerſary. Wherefore I thinke no man will take it amiſſe that I inſert this following *Theoreme.*

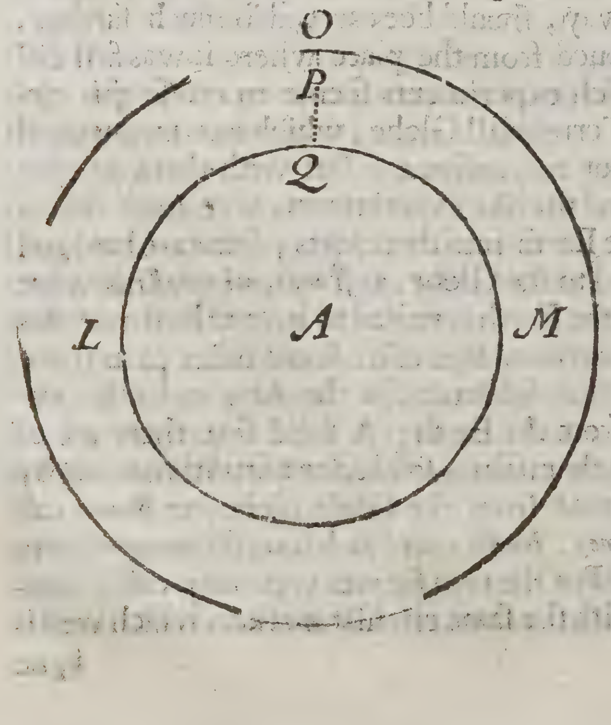
1 *It is probable that the terreſtriall Globe hath a circular motion.*

Copernicus aſcribes three motions to the ſpheare of the Earth, whereof the firſt is in the ſpace of 24 houres about her owne axell; making the day and night, and is therefore called the *Diurnall*: The ſecond is yeerely, wherein the Center it ſelfe of the Earth is moued from Weſt to Eaſt, deſcribing the circle of the Signes. The third is a motion of *Declination* performed in an annuall reuolution; reflecting againſt the motion of the Center; for the Axis of the Earth is ſuppoſed to haue a *conuertible* nature, whereas if it ſhould remaine fixt, there would appeare no inequality of day and night, *Spring*, *Autumne*, *Summer*, or *Winter*: I will not here curiouſly diſtinguiſh the differences, limits, and periods of theſe three motions, but leaue it to the skilfull Aſtronomer, to whom properly it appertaines: it is enough for mee to ſhew it probable that the Earth ſhould challenge to it ſelfe a circular motion, in proſecution of which I ſhall labour chiefly to eſtabliſh that firſt motion which is of the Terreſtriall globe about her owne axis, which is the eaſieſt both to beleeue and vnderſtand. That I may the better expreſſe the grounds of this opinion, I will labour to proue theſe two points. 1 That this opinion is conſonant to reaſon. 2 That it no way contradicts the ſenſe of the *Holy Scripture*. The former aſſertion wee will againe diuide into 3 articles. 1 That the motion which wee ſeeke to eſtabliſh in the Earth cannot without much abſurdity bee granted to the heauens. Secondly that it no way contradicts to nature of the *Earth* it ſelfe. Thirdly, that the arguments produced againſt this opinion, are not ſo ſtrong, but may bee anſwered with probability. Firſt therefore finding the dayly riſing and ſetting of the Sunne, Moone, and other Starres to ariſe from ſome motion, wee are to ſeeke out the true ſubiect of this motion. It is agreed vpon by all that this ſubiect muſt bee the *Heauens*, which are carryed in 24 houres from Eaſt to Weſt, or the *Earth* which muſt moue in the ſame time from Weſt to Eaſt. For the firſt wee muſt take as granted of thoſe which defend the oppoſite opinion theſe two grounds 1 That the ſubiect of this motion (if it bee a heauenly body) is the firſt moueable and ſupreame ſpheare of all the celeſtiall machine; becauſe all the reſt haue aſſigned them their ſeuerall motions. 2 That of two bodies circularly mouing vpon the ſame Center, in the ſame ſpace of time, that which is greater in quantity muſt needs haue the ſwifter motion; as wee ſee the ſpokes of a wheele to moue faſter neere the circumference, but ſlower in thoſe parts which are ioyned to the Center. This granted, wee ſhall find the greateſt of the firſt and ſupremeſt orbs to bee ſo incomparably vaſt in proportion to the Earth, and the motion of it according to this magnitude to bee increaſed to ſuch a ſwiftneſſe, as muſt needes tranſcend all fiction and imagination. For beſides the two Elements placed by the *Peripatetickes* betwixt the *Earth* and the *Celeſtiall* bodies, to wit, *Aire* and *Fire*, which challenge no meane diſtance betwixt their concaue and conuexe *ſuperficies*: who knowes not how many diſtinct and ſtrange concamerations of Orbes and circles are placed and ſigned out betwixt the *Moone* and the firſt Moueable? *Ariſtotle* hath reduced all the Orbes to eight. whereof ſeuen were allotted to the ſeuen Planets, but the eight to the fixt Starres, which hee ſuppoſed to bee faſtned as ſo many nailes in the ſame wheele. But *Ptolomie* perceiuing this number to bee inſufficient to ſatisfie his obſeruations, was inforced to adde a ninth to encreaſe the number. Yet this contented not *Alphonſus*, but hee muſt make vp tenne. And although this opinion preuailed a long time in the Schooles of *Philoſophers*, as moſt exact and abſolute; yet came it farre ſhort to ſatisfie the ſearch of two latter Aſtronomers, *Clauius*, and *Maginus*; who to adde ſomething to Antiquity, haue found out another orbe, and ſo the whole tale is become eleuen: and much it is to bee feared that the big-ſwolne belly of this learned *Ignorance*, will beget more children to help the Mother, becauſe all the former haue proued lame and impotent: God ſend her a ſafe deliuery. To returne to my purpoſe; all theſe orbs thus ranged and concamerated in order, cannot but haue each of them a great and extraordinary thickneſſe and profundity: being to carry in them ſuch huge and vaſt bodyes, as the *Sunne* and *Starres*, which are of themſelues mighty Globes, for the moſt part greater then the Earth, as Philoſophers haue found out by diuers Mathematicall inſtruments, and expreſſed in Tables. Alſo becauſe amongſt the Planetary Orbes wee ſhall finde them clouen into many partiall and leſſer Orbes, as *Epicycles* and *Excentrickes*, the firſt of which muſt in reaſon ſurpaſſe the thickneſſe of the *Diameter* of the Planet. The profundity of all theſe Orbes is meaſured by their Diameters, which wee ſhall find to ſurmount each other in extraordinary proportion. For the Diameter of the Earth is 1718 *German* miles. The greateſt diſtance or elongation of the *Moone* being new, 65 ſemi-diameters of the Earth; the leaſt is 55 ſemi-diameters. The greater elongation of the Moone in the middle ſpace is 68; the leaſt 52 ſemi-diameters of the Earth. Notwithſtanding it is very probable, that the Orbe of the Moone is yet of more thickneſſe and profundity. To paſſe ouer *Venus* and *Mercurie*, and come to the *Sunne*, wee ſhall find his diſtances from the Earth in his greateſt *Excentricity* to bee 1142 ſemi-diameters of the Earth. *Mars*, *Iupiter*, and *Saturne*, are yet farther off from the Earth, and their Orbes endowed with a greater treaſure of thickneſſe. The diſtance of the *Firmament* wherein are placed the fixt Starres, is by the beſt Mathematicians thought incomprehenſible, and not meaſurable by mans induſtrie: in ſo much that *Ariſtotle* holds the Earth no other then as a point, if it bee compared with the eighth Spheare, which hee ſuppoſed to bee the higheſt and firſt Moueable. To let paſſe the *ninth* Spheare; the *tenth*, which was vulgarly thought the firſt Moueable, if it bee valued according to the proportion of the reſt, would haue his conuexe *ſuperficies* moued ſo faſt in one houre, that it would ouercome ſo much ſpace as 3000 greater *circles* of the *Terreſtriall Globe*; for as much as in the conuexe *ſuperficies* of the ſtarry Firmament, it would containe more then 1800. And who can bee ſo ſharpe ſighted to ſee the profundity and thicknes of this orbe, containing in it ſtarres innumerable; whereof ſome are apparent to each mans eyes, others lying hid by reaſon of the diſtance, whereof many haue lately beene diſcouered, by reaſon of the Trunk-ſpectacle lately found out: ſo that it may bee a probable coniecture, that all theſe ſtarres are not placed in the ſame Orbe, or at leaſt that this Orbe is farre greater and deeper then the ordinary current of Aſtronomers haue imagined it to bee. To theſe eight Orbes here deciphered, ſhould wee adde the *Cælum Chryſtallinum*, the *Primum Mobile*, the Idol of our common *Aſtrologers*; and another, which *Clauius* and *Maginus* haue inuented; what bound ſhould wee ſet to the greatnes of the Heauens, or the ſwiftneſſe of their motions? how farre beyond all rouing imagination or Poeticall fictions ſhould it tranſcend, as thatwhich neither Nature could euer ſuffer, or the wit of man vnderſtand? a motion a thouſand-fold ſwifter then the flight of a bullet from a peece of ordinance, I had almoſt ſaid, then thought it ſelfe: For if a man caſt his imagination on ſome marke or degree in the *Sunnes* parallell on the Terreſtriall Globe, and ſo inſtantly transferre it to another, and ſo to a third, paſſing ouer at each time the diſtance of 100 miles; hee would find the Sunne to bee farre ſwifter in his motion, and to haue ouer-paſſed him incomparably in his courſe: were the *Sunne* placed in the *ſuperficies* of the *Earth*, and his courſe no greater then one of the greater circles of the Terrene Globe, hee ſhould by their owne computation, finiſh his courſe in 24 houres; and ſo runne 21600 miles in that time, which maketh 900 miles in one houre. And if this motion ſeeme ſo ſwift, that it could hardly haue credit among ordinary capacities; what ſhould wee thinke of this motion, which is imagined infinitely ſwifter? If *Ptolomie* feared leſt the Globe of the Earth ſhould be diſſolued and ſhattered in pieces by a far ſlower motion; of what ſhould wee imagine the heauens to be made, which can ſuffer ſo portentous and incogitable a whirling? Here the common Philoſopher ſtands aſtoniſhed, and rather then hee will be thought to know nothing, hee will ſay any thing: why (ſaith he) ſhould wee not beleeue it? ſith the Heauens in their motion find no *Reſiſtance*, whereas all other bodies are ſlacked by the *medium* or Aire by which they are to moue. If in the Heauens were any ſuch *let* or hinderance, it would bee either in the *Agent* or Mouer; or in the *Patient* or body moued: Not in the mouer, becauſe (as *Ariſtotle* hath taught) the Heauens are moued or turned round by an *Angell*, or *Intelligence*, fixed to his Orbe, of a *ſpirituall* and immateriall ſubſtance, which in a body meetes no oppoſition. Not in the body moued: becauſe of it's owne Nature it is prone and inclinable to this motion. But this reaſon is like a reed that hurts his hand that leanes on it: for firſt, what *indigence* or neceſſity in Nature is obſerued ſo great, to bee the father of ſuch Intelligences? What ſerious iudgment can euer imagine the Angels to bee like gally-ſlaues chained faſt to their gallies, or turne-ſpit-dogs labouring in their wheeles? To what vſe ſhall they ſerue? not to *ſtirre* vp and beginne the motion; for why ſhould we debarre the Heauens from the priuiledge of all other Bodies farre leſſe excellent, whoſe motions challenge no other cauſe or beginning then their owne forme and nature: Not to *Regulate* and confine this motion; for Nature which beginnes any action or motion, is able of her ſelfe to ſet limits and bounds vnto it, without the helpe of any externall agent. Finally not to continue this motion; for as wee are taught in our *Philoſophie*, Euery *Naturall Agent*, if it bee not hindered, ſtill acts to the vttermoſt of his power, and therefore needes no externall coadiutor to continue his action: for otherwiſe we might ſuppoſe the Heauens to grow weary and faint in their intended courſe. Secondly, whereas they ſay there can bee no *Reſiſtence* in the body moued, they contradict their owne grounds: for it is agreed by all, that the higher Orbs doe turne and wreſt about the lower: I would willingly aske, by what kinde of action, either by a *vertuall* influence or emanation, or els by a *corporall* touch and application: The former is improbable, and (as farre as I can gather) not auouched by any; and were it ſo, it would ſeeme ridiculous; for why ſhould wee rather aſcribe this effect to an vnknowne influence of an externall body, then to the vigour of his owne *forme* and *nature*. For if one orbe in this ſort can moue another, why could it not moue it ſelfe, being more preſent to it ſelfe then any other; If they ſay by a *corporall* application of bodies and their parts. I ſee not how they can auoid this *Renitencie* and reaction, which alwayes doth ſuppoſe ſome reſiſtence: for how can one ſolide and hard body bee imagined to heaue and puſh another forward without ſome reluctancy in the patient? becauſe the inferiour Orbe hauing of it ſelfe a proper motion, this muſt needes be violent, as ſuppoſing a forcing & wreſting of Nature from her proper courſe, whereof it is not hard to ſhew a ſenſible demonſtration; becauſe the Orbe naturally directed one way, is turned and directed another way at the ſame time: which both motions concurring in the ſame body, muſt needes offer violence one to the other. Moreouer the immunity from *corruptible* qualities granted to the Heauens; which is the ground of this opinion; hath beene muh talked of amongſt the *Ariſtoteleans*, but neuer warranted by any certaine demonſtration: wee ſee (ſay theſe Philoſophers) the Heauens to haue remained ſince the beginning of the World, without any ſenſible alteration and change: and therefore muſt all the *Elementary* and corruptible qualities bee excluded. To diſproue this, I need goe no farther then the laſt *Comet*, which Mathematicians by the *parallax* found to bee in the heauens. And whereas otherwiſe they ſeeke a ſenſible alteration in other parts, they deceiue themſelues: for as in the earth whereon wee dwell, howeuer the parts interchangeably corrupt and ingender dayly, yet the whole Globe will apparantly remaine the ſame, keeping it's integrity: ſo may it happen to many of the ſuperiour Globes, whoſe parts dayly corrupted and renewed againe (although, for the great diſtance, to vs inſenſible) the whole Globe remaineth ſtill perfect in his perfect *Sphericity*. I ceaſe any further to inuade anothers Prouince, and therefore deſcend to a ſecond argument, to proue this extraordinary, violent, and ſwift motion in the heauens to bee improbable. It is ordinarily obſerued in other Orbes of the heauens, that the higher the Orbe is placed, the motion is ſlower; as for example, the Spheare of the Moone, which is next the Earth, is carried about in 27 dayes: *Mercury* and *Venus* are ſlow enough in their courſe, as the former in 80 dayes, the latter in 9 moneths: the *Sunne* in a yeere; *Mars* in 2 yeeres; *Iupiter* in 12; *Saturne* in 30. Alſo thoſe Aſtronomers which giue the *fixt* ſtarres a motion, would haue them to finiſh their courſe, according to *Ptolomie*, in 36000: but if wee will beleeue *Copernicus*, in 25816 yeeres: ſo that the higher and greater the circles be, ſo much ſlower will be the motion: what iniury were it then to the concord and harmony of Nature, to impoſe vpon the higheſt Orbe of all, ſuch an vnmeaſurable ſtrange motion, which might ſtrike the moſt *Seraphicke* Angell into admiration? To theſe may bee added other Arguments in *Copernicus*, which albeit they be not demonſtratiue, will make the matter more probable. Firſt, that Nature in all things is a compendious and ſhort worker, and vſeth not many helpes for ſuch thinges as may bee performed by fewer : and therefore need wee not to vſe the helpe of ſo many Orbes and concamerations to ſquare our obſeruations, which will find more ſteady footing in this one ground once granted, of the Earth's *circular* motion : Secondly it will ſeeme more conſonant and agreeable to Nature, that the higheſt and vttermoſt Spheare of all, which bounds and engirts in all the World beſides, ſhould reſt quiet and vnmoueable, then to ſuffer ſuch an intollerable motion, as might endanger the whole Fabricke. Laſtly, I may adde this one, that this *diurnall* motion, granted to the firſt Moueable, can in my iudgement hardly ſtand with the regularity of heauenly Bodies, if wee expreſſe it no otherwiſe then the ordinary ſort of Aſtronomers. For a regular motion is defined, to bee that whereby in equall times a body is moued through equall places. But this *Diurnall* motion receiued from the firſt Moueable, concurring with the *Sunnes* annuall motion, will exclude this equality. For firſt it is granted, that the Sunne in his motion from the *Æquator*, to the *Tropicke*, according to ſenſe, runnes euery day in a diſtinct *parallell* : for although euery minute hee declines ſomewhat from the *Æquator* toward the *Tropicke*, yet the difference is not ſenſible : ſo that wee may well euery day aſſigne a parallelll-ine to the *Sun's* motion. Secondly, they muſt grant that theſe parallells are diminiſhed, and grow leſſe and leſſe toward the *Tropicke*, from the *Æquator*. Thirdly, that (as wee haue foreſhewed) of two bodies mouing in the ſame time on the ſame center, that ſhould moue faſter, which is greater : ſo one body mouing in diuerſe vnequall circles, in equall time, it muſt of neceſſity follow that it muſt needes moue faſter ; in that which is greater : here wee may conclude, he moues faſter in the *Æquator*, then in the *Tropicke*, becauſe in the one hee is carryed in a greater parallell, in the other a leſſe, and yet in the ſame period of time, as wee may ſee in this Figure following. Let the *Sunne* bee in the point of the Eclipticke A, it is manifeſt that he will ſenſibly moue for that day in the parallell A P. Then let him bee moued by his periodicke motion, into the point of the Eclipticke B, it will for that moment moue in the



parallell I B O. Laſt of all, let it bee in the point of the Æquator C.his parallell will bee HCL. It is manifeſt out of our former grounds, that he will be moued floweſt in A P. Faſter in I O. Faſteſt of all in H C L. Which ſwiftneſſe and ſlowneſſe in the Suns motion makes it irregular. Some haue thought to ſalue this by ſaying that this motion is *Regular*, becauſe in equall time, the Sunne goes *proportionall*, not *equall* ſpaces, which *Aguillonius* holds in his *Opticks*. But this ſhift is friuolous; becauſe it takes not away the obiection, why the Sunne ſhould moue faſter and ſlower. For the Heauens being a *naturall*, not a *voluntary* agent; and according to theſe grounds finding no hinderance or impediment; muſt alwayes worke to his vtmoſt power, and ſo cannot ſlacke or increaſe his action, or motion, that it ſhould moue faſter or ſlower. Hitherto haue wee ſhewed that this *Diurnall* motion cannot without ſome abſurdity bee granted to the heauens: in the next place we are to ſhew, that it no way can croſſe the Naturall diſpoſition of the *Earth* it ſelfe, which wee ſhall demonſtrate in this manner. If this circular motion ſhould croſſe the diſpoſition of the Earthly Globe, it would happen either immediatly in reſpect of the meere Nature, which the *Logicians* call *à priore*; or els in regard of certaine properties, which follow neceſſarily the Nature of it, which they terme *à poſteriori*. If they ſay it happens *à priori* in regard of the meere Nature, they muſt neceſſarily haue recourſe to the *proprieties* and accidents for a demonſtration: For the Internall formes of all things being in themſelues inſenſible, cannot be diſcouered vnto vs but by their externall proprieties. But if probable coniecture may here find any place, I ſee no reaſon why the earth being found to bee of a magneticall temper, ſhould not challenge the ſame which other magneticall Globes farre greater then the *Earth*, poſſeſſe; to wit, a circular reuolution about her owne Poles; which *Kepler* and *Galilæus* haue obſerued aſwell in the *Sunne*, as *Iupiter*: and in like matters to iudge alike, ſeemes more warrantable, then to faigne a diſparity, which Nature neuer grounded, or obſeruation found. But this, as a matter of ſmall note, I eaſily paſſe ouer, following the foot-ſteps of our Aduerſaries, which ſeeke to demonſtrate the Earth's *ſtability* out of the externall effects and proprieties. If then this *Reuolution* contradict any proprietie, it muſt bee of neceſſity either in regard of the *Quantity* and *Magnitude*; or els in reſpect of the *figure* and *quality*, or of ſome *Motion*, or of the *ſite* and poſition; for I find no other propriety of any moment which can enter into this conſideration: Firſt, that the *Quantity* can no way thwart this circular Reuolution, is manifeſt, becauſe it would happen either in that it were too *Great*, or too *Little*. It cannot be by reaſon of the greatnes; becauſe the great globes of the *Sunne* and *Iupiter*, manifold greater then the Globe of the Earth; are by late experiments of the Trunk-ſpectacle, found to moue about their owne Axell in a ſmall portion of time: the like haue others deliuered of the *Moone* and *Venus*. It is not then the Maſſe or quantity which can hinder it in the Earth; neither on the other ſide can it bee the *ſmalneſſe*: for bodies ſmaller are found as apt, or rather apter to receiue a circular motion, which they will not deny mee: and therefore cannot this be preiudiciall to the motion of the Earth. In the next place the figure of the Earthly Globe cannot hinder this motion, becauſe by all ſound Philoſophers, being acknowledged to bee *Sphericall*, it cannot but bee deemed moſt apt to receiue *Reuolution*; in ſo much as ſome haue hence laboured to draw an argument for the Earths circular motion, as deeming this Figure to bee giuen to the Earth for no other end or vſe. Thirdly, no *Quality* in the Earth can reſiſt this circular motion; for this quality (by the conſent of all) would bee the naturall heauines or waight of the Earth: But this heauines takes not away the naturall Reuolution: 1 Becauſe *Grauity* or heauineſſe is nothing els but the inclination of the parts of the Earth, returning to their naturall place, hauing beene ſequeſtred from it: but theſe parts hauing once regained their proper places, moue no farther, nor are in thoſe places eſteemed heauy, or waighty: whence it is commonly ſaid amongſt the *Peripateticks*, *Nihil grauitat in ſuo loco*, nothing is heauy in his owne place, which may eaſily bee demonſtrated out of *Staticke* principles, whereby we finde heauineſſe and lightneſſe to bee giuen to the bodies according to the *medium*, and their maſſineſſe and ſolidity in reſpect of one to the other. 2 If this heauineſſe bee oppoſed to the circular motion, then either *immediatly* by it ſelfe, or *ſecondarily* by ſome concomitant accident. It cannot bee the firſt, becauſe grauity is a quality; but motion, an action; which for ought my Philoſophy hath taught mee, are not oppoſite: If by reaſon of ſome accident; then (no queſtion) becauſe it is contrary to lightneſſe or leuity, which ſeemes requiſite to ſuch a motion: We willingly yeeld this naturall grauity of the parts of the Earth to ſtand oppoſite to the motion of *Aſcent* or mouing vpward from the Center; but neuertheleſſe it is not any way contrary to the circular motion: 1 Becauſe contraries are alwayes ſuppoſed to be *in eodem genere*, in the ſame kind: but the motion of heauy bodies to the Center, and of the Earth about the Center, are not in the ſame kinde, the one being a *right* motion, the other *circular*; neither can the waight of the Terreſtriall maſſe adde or diminiſh any thing in regard of the circular motion, becauſe a *Sphericall* and a *right* motion cannot either directly concurre, or directly oppoſe one the other. 2 Wee may vrge out of the 4 Chap. of *Ariſtotles* 1 *booke De Cælo*, That no circular motion can admit of contrariety: which hee confirmes by a demonſtration, which wee forbeare here to inſert, being loath to roue too farre from our preſent matter. At length wee will proue that this orbicular motion giuen vnto the Earth, cannot ouerthrow or thwart any other motion of the Earth: for if this were ſo, it would happen for one of theſe two reſpects; Either becauſe the Earth hath ſome motion or other contrary to this; or els becauſe diuers motions cannot bee in the Earth. The firſt cannot be true, for that wee haue ſpoken before; becauſe the right motion they finde in the Earth, cannot bee iudged contrary to the

Sphericall; neither can the later bee admitted as an vndoubted truth; for howſoeuer *Ariſtotle* ſets it downe for an Axiome, that *one ſimple body hath but one ſimple motion*, yet being abſolutely vnderſtood without any limitation, will bee found by experience falſe: for it is manifeſt out of the experiment of the new *Perſpicils*, that the Bodies of the *Sunne* and *Iupiter*, ſimple in nature, (if wee beleeue *Ariſtoteleans*) haue at leaſt a double motion, the one vpon their owne Poles leſſe then *Diurnall*, the other of their *Centers*, which are moued from the Weſt vnto the Eaſt, vpon other Poles familiarly knowne vnto Aſtronomers. The *Peripatetickes* heere ſeeke an euaſion, by diſtinguiſhing the motions of the Planets into a proper or naturall, and *Accidentall* or mutuaticious: but this anſwer comes not home to this preſent queſtion. Firſt, becauſe theſe two motions of the *Sunne* and *Iupiter* will eaſily bee proued to bee *naturall* and without violence, or reſtraint: Secondly, becauſe in this anſwer they ſuppoſe the Heauens to bee cut and diuided into diuerſe *Orbes*, *Sections*, and *Concamerations*, which later Aſtronomers vpon better experience haue derided, or at leaſt omitted as *Hypotheſes* or ſuppoſitions, to ſettle Imagination, rather then *reall*, or true grounds. If they would vnderſtand this Principle of *Ariſtotle*, to wit; *That one ſimple body ſhould challenge one ſimple motion*: of a motion of the ſame kinde it might perhaps obtaine ſome credit. But the right motion of the parts ioyning to the whole, and the Circular motion: alſo the Circular motion of a Planet about his owne Axell, and the Circular motion it ſelfe about the Earth, are found to bee diuerſe kindes, and therefore no way incompatible in the ſame ſubiect. Moreouer what infallible argument can perſwade vs, that the Globe of the Earth is a meere ſimple Body, ſuch as *Ariſtotle* deſcribes vnto vs in his Philoſophie? Either this imaginary ſimplicitie muſt bee ſought in the *Reall Exiſtence* of the Earth, or els in our *mentall Abſtraction*. The former they cannot auerre, becauſe not only the Elements themſelues, by their owne confeſſion, are impure and corrupted: But the whole Globe of the Earth ſeemes to conſiſt of diuerſe mixtures, and Heterogeneall bodies, which apparantly exclude ſuch ſimplicity. If they would haue it rather to conſiſt in the Abſtraction or ſeparation of the minde, which may diuide and diſtinguiſh betweene the true nature of the Earth, and his Accidentall Natures; I ſhall not contradict: although it ſeeme rather grounded on imaginary coniecture, then experience: That the Earth of it ſelfe diſtinguiſhed from the waters, ſhould haue any ſuch ſimple Nature. If wee follow reaſon and experience as our Guides, wee ſhall obſerue in the Terreſtriall Globe a twofold conſtitution; The one *Elementary* from the parts whereof it conſiſts, out of which it cannot challenge any motion, but the *right*, which is of the parts ſeparated from the whole, agreeing to the Earth, Water, and all other heauy bodies thereof conſiſting. The other magneticall, wherein all other bodies are vnited in one *Magneticall* forme of the Earth. In which ſort the whole Globe of the Earth may bee termed a *Homogeneall* ſubſtance; for howſoeuer the matter and the Elements whereof it conſiſts, ſeeme Heterogeneall, and diuerſe one from the other; yet ſince in this Magneticall Nature, there is a Harmony and Communion, well wee may call it a Homogenity of the Forme and Nature; not of the *Matter* and *Quantity*, as common Philoſophers commonly vſe the word: So that euery part or Element whereof this Terreſtriall Spheare is compounded, may claime his owne motion, and properly; yet all conſpiring in one vniuerſall forme of a Sphericall Body, may notwithſtanding be turned round with a Sphericall motion. In the laſt place wee are to proue that this Circular motion granted vnto the Earth, can no way oppoſe or indanger the naturall *ſite* or poſition of the Earth: If the ſituation or poſition were feared to bee changed, it muſt needes happen one of theſe wayes; either that the *Center* of the Earth ſhould bee moued out of his place: or that the *parts* ſhould bee ſeparated & diſtracted one from the other; or that the *Poles* ſhould be changed and altered: The firſt cannot touch our aſſertion; becauſe in this place wee affirme not, that the center of the Globe is moued out of his place; but that the whole Earth in the ſame place is turned round vpon her owne Center. For the opinion of *Copernicus*, which holdes the Center of the Earth to moue round about the earth, wee ſhall cenſure in our next Chapter. In the ſecond place, the parts of the Earth by this motion cannot bee ſeparated or diſunited one from the other: firſt, becauſe all the parts are vnited to the whole by their naturall grauity; that if by chance they ſhould bee ſeparated, they would naturally returne backe vnto their owne place. Secondly, this motion is ſuppoſed *Naturall* & not *violent*, which in ſo great and maſſie a Body, can make no ſenſible Alteration. Laſtly, the Poles of the Earth by this meanes, cannot bee moued out of their places; becauſe by a certaine *Magneticall verticity* (as wee haue formerly ſhewed) the ſame Poles of the Earth alwayes naturally reſpect the ſame points of the Heauens, as if they were bound vnto two firme Pillars indiſſoluble. Hitherto hauing proued the *Circular* motion of the Earth, neither to bee giuen to the Heauens without ſome abſurdity, and yet no way to contradict or oppoſe the Nature of the Terreſtriall Globe; wee are in the third place to examine the reaſons vſually vrged againſt this Aſſertion. The firſt reaſon is drawne from *ſenſe*. If there were any ſuch *Sphericall* motion (ſay they) how comes it to paſſe, that it cannot of vs bee perceiued? an Argument worthy ſuch Philoſophers, as meaſure all rather by ſeeming ſenſe, then *Demonſtratiue* reaſon; who cannot obſerue on the ſea in a calme, that the ſhip wherein hee is carried will ſeeme to reſt, or at leaſt to moue ſlowly, and the clifts and ſhores to moue vnto the oppoſite part? What then ſhould wee thinke of the motion of the whole Terreſtriall Globe? which hath leſſe cauſe to bee perceiued, then that of a ſhip? The Bulke of a ſhip in reſpect of the Earth is ſmall and of no quantity; the other being huge and maſſie: The motion of the ſhip meerely violent, inforced by the windes; of the Earth naturall and vniforme, ſtirred vp of his proper and naturall inclination, ſo that if any ſuch motion be in the earth, it were impoſſible to bee perceiued by ſenſe: Secondly, they vrge againſt vs, that in *Homogeneall* Bodies, there is the ſame motion of the *whole*, and all the *parts*: But euery part of the Earth (as experience teacheth) is moued downeward toward the Center, and therefore the whole can haue no other motion: To this obiection wee haue partly anſwered before; yet to giue further ſatisfaction, wee will adde ſomething more: It is one thing to ſpeake of the *whole* Terreſtriall Globe and Spheare; another of the ſeuerall *parts* and Elements whereof it conſiſts: If the whole Spheare bee vnderſtood, wee aſcribe vnto it no other motion but the circular, which wee here labor to eſtabliſh. The parts, whereof this Terreſtriall Spheare conſiſts, may bee conſidered two wayes; either as they are *vnited* in the whole by a Magneticall forme, or *diſioyned* and taken by themſelues: In the former the parts of the Earth are ſuppoſed to moue in the ſame motion, by which the whole Spheare of the Earth is moued; becauſe the *whole* and all the *parts* taken together, are the ſame, and ſubiect to the ſame circular reuolution. Notwithſtanding this, any *part* ſeuerall and diſioyned from the whole, hath a right motion downeward toward the Center, by which it returnes to its true naturall vnion. This inclination of the parts agrees not with the whole Earth, neither vnto any part vnited and conglobated to the whole; but onely to a part ſeparated from his place; ſo that the whole, may notwithſtanding in his place inioy a circular motion. Now to come more neerely home vnto their Arguments drawne from the *Homogeneity* of the Earth, wee anſwer as before, that there is a twofold *Homogeneity*: The one of the *matter* and quantity; the other of the *Magneticall forme* and Nature of the former: wee may conclude out of the right motion of all the parts, the diſpoſition of the whole, ſo wee vnderſtand it in a good ſenſe: firſt that euery part is here to bee vnderſtood, not in, but out of his proper place: Secondly, that by the *whole*, wee ought not to vnderſtand the whole Globe with all his parts, conformed in one Sphericall frame; but all the parts *indefinitely* taken; for if wee ſhould vnderſtand of the whole Globe, their Argument will in no way hold true: If according to the later, wee might well grant them their Concluſion, yet can it not oppugne our Aſſertion: Becauſe it will follow out of the Naturall inclination of euery part, that all the parts ſeuerally taken, haue ſuch a diſpoſition of returning to the Earth, being ſeparated there from: Yet will not this by any neceſſary inference bee proued to agree to the whole Globe of the Earth; but rather will it follow contrarywiſe, that the whole Spheare of the Earth is moued circularly, and therefore euery part with, and in it, is moued with the whole in the ſame motion. A third argument which is thought greater then all the other, is drawne from two experiments: The firſt is, that a *ſtone* or *Bullet* let fall from a higher place to the ground, will perpendicularly deſcend to the point of the Earth right vnder: Secondly, that two *Bullets* imagined to bee of equall weight and matter, being diſcharged from equall pieces of ordinance, with the like quantity of powder, the one towards the Eaſt, the other towards the Weſt, will reach an equall diſtance in the Earth; both which would ſeeme impoſſible if wee grant this ſuppoſition of the Earths circular reuolution. For in the former caſe, the Earth ſliding away ſwiftly during the fall of the ſtone, would change the point marked out for another: And in the ſecond, for the like cauſe, the Bullet ſhot towards the Eaſt, being preuented by the ſwiftneſſe of the Earth's motion, carrying along with it the Ordinance out of which it proceeded, ſhould returne backe ouer the ſhooters-head; and contrarywiſe that Bullet ſhot towards the Weſt, beſides his owne motion, by the motion of the Earth the other way, ſhould bee carryed ſo much farther, as the Earth is remoued from the place where it was firſt diſcharged: Both which experiments ſeeme to croſſe this circumgyration of the Terreſtriall Globe, which our magneticall Coſmographers labour to confirme: But with them to giue an anſwer to theſe and the like experiments, wee muſt diſtinguiſh the parts of the Earth into three ſorts; ſome are hard and ſolide parts, adioyned to the Globe, as *ſtones, mineralls*, & what elſe in the bowels of the Earth is vnited to it, or at leaſt neceſſarily adherent to the outward face of it. Some other parts there are of a thinne and fluid ſubſtance, as the Aire and other vapours in it, deriued from the Earth; A third ſort there are of ſuch parts as being in themſelues ſolide, are notwithſtanding by ſome violence ſeparated from the ſolide globe, as *ſtones* caſt into the Aire; *Arrowes*, *Bullets*, and ſuch like, diſcharged from the hand or Engine: For the two former wee may eaſily imagine them carried with the ſame circular motion, which we aſſigne vnto the *whole*, being no other then the parts of it depending from the whole maſſe: For the third ſort (whereof conſiſts the difficulty) wee cannot imagine them ſo moued round, as if they were wholly ſeparated from the Communion of the Earthly Spheare; for howſoeuer there ſeemes a ſeparation according to *matter* and quantity, yet retaine they the ſame magneticall inclination to the whole maſſe, as if they were vnited to it; and therefore ſuch ſolide parts are moued with the ſame vniforme and naturall motion wherewith the Earth it ſelfe is turned; ſo that in ſolide bodyes ſo ſeparated from the ſuperficies of the Earth, of an Arrow or Bullets ſhot, wee muſt imagine a twofold motion: The one *Naturall* & vniforme, whereby they are moued as homogeneall parts according to the reuolution of the whole Spheare: The other *violent* by force impreſſed from the Agent: The right motion proceeding from the ſtrength of the ſhooter, cannot croſſe or hinder the Naturall, becauſe the one being right, and the other circular, admit no ſuch proportion, as that one ſhould hinder or further the other: Neither can theſe motions well be tearmed contrary or oppoſite, which are in diuers kindes: To explaine this matter farther, we will adde this Diagramme; Let the whole orbe of the earth bee imagined to bee L Q M; whoſe center is A; the thickneſſe of the Aire aſcending from the Earth O Q. Now as the orbe of this fluid ſubſtance of the aire aſcēding vniformely is moued round with the Globe



Globe of the earth, ſo muſt wee imagine the part of it marked out by the right line O Q to bee carried round with an vnalterable Reuolution. Wherefore if any heauy body ſhould bee placed in the Line O Q; as for example P, it will fall downe toward the center by the ſhorteſt way in the ſame line O Q: which motion downewards towards the center, can neither bee *hindered* by the circular motion of the Earth, nor yet *Mixt* or compounded with it: It cannot bee hindred: becauſe (as wee haue ſhewed) a Right-motion and a circular being not in the ſame kind, cannot properly bee reputed contrary: Neither for the ſame cauſe can they bee mixt or compounded: Wherefore this motion will be no other then one ſimple and Right motion, neuer varying from the Line O Q: which being once vnderſtood, it is no hard thing to imagine a Bullet or ſtone forced by equall ſtrength from Q towards L, and from Q towards the point M, to obſerue alwayes a like diſtance notwithſtanding the Earth's circular Reuolution. Hauing hitherto ſhewed this Sphericall motion of the Earth to bee poſſible, and no way to contradict Nature, wee are in the next place to ſhew it to bee no way oppoſite to the ſenſe of holy Scripture. This opinion of the Earth's circular motion, hath ſuffered much wrong by a certaine perſwaſion of ſome men, that it contradicts the Text of *Holy Scripture*. Some preciſe men, more ready to vrge, then vnderſtand what they alleage, will condemne without examination, and ſticke to the plaine letter, notwithſtanding all abſurdities, denying the concluſion in deſpight of the premiſſes. To theſe haue aſſociated themſelues another ſort; more to bee regarded, as more learned; the *Critickes* (I meane) of our Age, who like *Popes* or *Dictatours*, haue taken vpon them an Vniuerſall authority to cenſure all which they neuer vnderſtood. Had theſe men contained themſelues in their own bounds, they might queſtionleſſe haue done good ſeruice to the Commonwealth of Learning. But when the ſeruant preſumes to controle the Miſtriſſe, the houſe ſeemes much out of order. To ſeeke for a determination of a *Coſmographicall* doubt in the Grammaticall reſolution of two or three *Hebrew* wordes, (which ſome haue gone about) were to neglect the kernell, and make a banquet on the ſhells. But howſoeuer, we hope to make it appeare, that the Scripture vnderſtood as it ought to bee, is ſo farre from fauouring their opinion, that the words themſelues can hardly admit of ſuch a ſenſe, as they would faſten on them. But ere wee deſcend to the examination of particular places of holy Scriptures alleaged in their behalfe, wee will ſhew this opinion to bee much different from that of *Copernicus*, as ſomewhat more moderate, and able to ſuffer an eaſier reconcilement with the holy Text. For the places alleaged of ſacred Scripture, which ſeeme to oppoſe our Aſſertion, either ſeeme to proue the *circular* motion of the Heauens, or the *reſt*, and ſtability of the Earth. But this opinion holding a Mediocrity betwixt both, neither takes away the motion from the *Heauens*, neither oppugnes ſuch a Reſt or quietneſſe in the *Earth*, as the Scriptures vnderſtand. For firſt, albeit wee take away from the Heauens the *diurnall* motion, and giue it to the Earth: yet we grant to the heauenly Orbes their ſeuerall motions, allowing no part of it to bee abſolutely voide of motion. Secondly, wee muſt vnderſtand this in a fourefold ſenſe; as oppoſed to foure kindes of Motions. Firſt to the progreſſiue Motion of the *Center* of the Terreſtriall globe from place to place. Secondly, to the *ſeparation* or diſſolution of the parts one from the other, by which the Globe may looſe his integrity. Thirdly to the *Tranſlocation* of the Poles, whereby the Poles inclining to one ſide or another, may bee imagined to change their poſition. Fourthly, to the *Diurnall* Motion. In the firſt ſenſe wee giue a Reſt and ſtability to the Earth, becauſe the Earth, howſoeuer moueable, wee place in the Center of the world, as wee ſhall proue in the next Chapter. In the ſecond ſenſe we alſo grant it; becauſe all the parts of the Earth being of a heauy nature, fall naturally downewards, and vnite themſelues vnto the whole, to decline ſuch a diſſolution: In the third acception wee likewiſe allow ſuch a ſtability: becauſe the Poles of the Earth (as wee haue ſhewed) by their magneticall inclination, alwayes reſpect the ſame points in the heauens, and can from thence by no meanes remooue themſelues. Only in the fourth and laſt ſenſe wee exclude a Reſt, allowing onely a diurnall Reuolution from Weſt to Eaſt in twenty foure houres. The firſt argument alleaged againſt vs is taken out of the 1 Chapter of Eccleſiaſtes: *Vna generatio* (ſaith *Salomon*) *abit, & altera aduenit, quamuis Terra in ſæculum permaneat*: Wherein by the word עמדת which ſome interpret (*Stat*) they would inferre a perpetuall ſtability of the Earth. A childiſh conſequence, which a graue Diuine might well bee aſhamed to vrge: euery man of common vnderſtanding may plainely perceiue that *Salomons* ſcope in this Chapter was, to ſhew the vanity & vncertainty of all things vnder the Sunne: which as a ſpeciall argument amongſt others hee amplifies from the ſucceſſiue mutation and changes of men liuing on the Earth: in that one generation goeth away, and another commeth, but the Earth keeps her integrity, and remaines in the ſame ſtate. This Conſtancy then, or remaining of the earth, we can in no wiſe oppoſe to any circular motion, but to the changes and vncertainty of men in their generations; in which ſenſe our moſt learned Linguiſts vnderſtand it. Would not this ſeeme to any man a ridiculous argumentation, if any man ſhould thus diſpute: One Miller comes, and another goes, but the Mill remaines ſtill: *Ergo* the Mill hath in it no motion? Or in a Riuer, one generation of Fiſhes is produced, and another is decayed, but the Riuer remaines the ſame, *Ergo* the Riuer remaines ſtill vnmoued? Let any man goe no farther then the plaine wordes whereon theſe Grammarians ſtand, hee will eaſily find out another interpretation. For the word עמדת deriued from עמד ſignifies as much as to perſiſt, ſubſiſt, or to endure, being oppoſite to מעד which ſignifies as much as to ſtagger or ſtart aſide from his place, or poſition: ſo that nothing from hence can bee inferred to contradict the Sphericall Reuolution of the Earth in her proper place, vpon her owne Poles, which we only maintaine. A ſecond reaſon they draw from the Pſalme 104, out of theſe words, יסד-ארץ על-מכוניה בל-תמוט עולם ועד, wherein, (as one would perſwade) no leſſe then three arguments are couched in three bare termes: But theſe arguments will (I feare) proue as little as the former. For firſt the word יסד ſignifying as much naturally as to found or ſeat in a place or frame, is not altogether without a Metaphor giuen to the Earth;

Fundauit Terram ſuper baſes ſuas, ne dimoueatur in ſæculum. verſ. 5.

Earth, becauſe Almighty God hath ſo placed it vpon her owne center Poles and Axell, that ſhee cannot bee moued out of it: Likewiſe מכוניה implyes no other then a ſeat or place, being deriued from the word כון which ſignifies no more then to perfect, eſtabliſh, or make ready: The third is תמוט from the word מוט which can ſignifie no other then to incline, to nod, ſlide, fall, or turne aſide out of his place: All which can ſuffer no other paraphraſe or Interpretation then this, That Almighty God hath ſet the Globe of the Earth ſo ſtrongly fixed in her proper frame, that no power can bee ſo ſtrong to diſſolue this Fabricke, or turne her out of her appointed place: which expoſition of this place of Scripture, *Copernicus* himſelfe would eaſily grant; as no way oppoſite to the triple motion hee labours to eſtabliſh. Here are theſe three arguments drawne from three words, ſuddenly ſhrunke into nothing. Another reaſon which I take to bee ſtronger then the former, ſome haue taken out of the 19 Pſalme; where ſpeaking of the *Sunne*, hee vſes theſe words. *In them hath hee ſet a Tabernacle for the Sunne. 5 Which is as a bridegroome comming out of his chamber, and reioyceth as a giant to runne his courſe: 6 His going forth is from the end of the Heauens, and his circuite vnto the ends of it: and there is nothing hid from the heat thereof.* Out of which words the Heauens ſhould ſeeme to challenge the motion, which wee haue giuen vnto the Earth. To this we anſwer two wayes: Firſt, that although this may oppugne *Copernicus* his opinion, that the Sunne ſtandeth ſtill in the middeſt as the center of the World; yet may it well ſtand with our Aſſertion, who allow the Sunne his ſeuerall motion in the *Eclipticke*: whether thoſe words of the Pſalme bee to bee vnderſtood of the Sunnes *Diurnall* or *Periodicke* Motion, is not ſo ſoone decided: the Scripture not ſpecifying expreſſely either. 2 we may anſwer with the *Copernicâns*; That the Holy Ghoſt in theſe or the like places ſpeakes Ἀνθρωποπαθῶς: being willing to deſcend to the weakeſt of mens capacity, and not to trouble mens conceits with ſuch matters as to vulgar iudgements might ſeeme vnlikely or improbable. The like Analogie of ſpeech may wee finde in the firſt of *Geneſis*, where the *Moone* is called one of the greater lights in regard of her appearance, being notwithſtanding one of the leaſt. Theſe may ſuffice to ſhew the opinion of the earths circular motion to bee probable: I promiſed no more, & I hope I haue performed no leſſe. I neuer held it an article of my faith, to defend the one, or oppugne the other; and therefore leaue euery man to his owne free iudgement, to embrace or reiect what he pleaſe.

CHAP. V.

Of the Site, Stability, *and* Proportion *of the Earth.*

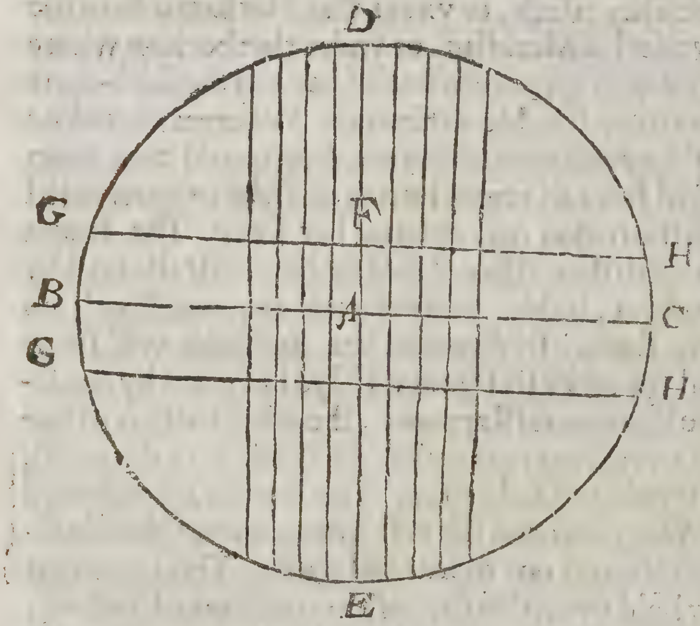
1 OF Terreſtriall affections which agree in reſpect of the Earth it ſelfe, wee haue hitherto ſpoken: We are now to treate of ſuch as agree to it in reſpect of the Heauens. Theſe are chiefly three; 1 The *Site*, 2 The *Stability*. 3 The *Proportion*.

2 The Site is the locall poſition of the Earth in reſpect of the Celeſtiall Bodyes.

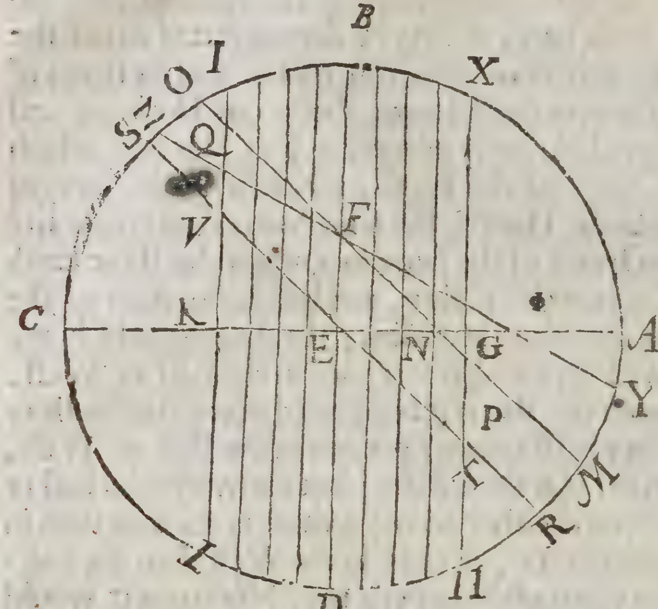
It might ſeeme a hard and almoſt impoſſible taske for any man to reconcile that which hath beene ſpoken in the former Chapter concerning the *Earths circular Reuolution*, with the grounds of common Geographers, which hold the *Terreſtriall Globe* to bee ſetled and fixed in the Center of the world. The reaſon is; becauſe ſuch as hold the circular motion of the Earth, (whereof the chiefe is *Copernicus*) would haue the *Sun* to ſtand ſtill, as the fixt Center of the *Vniuerſe*, and the *Earth* to moue round about him betwixt *Mars* and *Venus*, which ſeemes cleane oppoſite to the former opinion. I muſt confeſſe that *Copernicus* his opinion entirely taken and vnderſtood, ſtandeth altogether oppoſite to theſe our grounds: yet may that motion of the *Earth* which we haue eſtabliſhed in the former Chapter (for ought I yet know) bee well reconciled with their opinion, which hold the Earth to bee the Center of the world. For the circular Reuolution wee gaue to the Terreſtriall Globe, was not a motion of the *Center* of it, from one place to another, as that of the Starres which moue round about the Earth; but rather a turning of it ſelfe in its owne place, vpon her owne Poles and Axell-tree, in ſuch ſort as the wheele of a mill, or ſuch a like engin fixt in one place is turned vpon his owne Axell: So that the motion wee there vnderſtood was only the *Diurnall* motion of 24 houres, making the Day and Night. The other two motions mentioned by *Copernicus*, may be found out in the Heauens, and left to *Aſtronomers*. The reaſons why I entirely embrace not *Copernicus* his opinion, are chiefely two. Firſt, becauſe it ſeemes too harſh and diſſonant in nature, to make one and the ſelfe-ſame body ſubiect to ſo many motions, eſpecially ſuch as by common Philoſophers is denied all motion. Secondly, becauſe the other motions granted to the Earth muſt needs ſuppoſe it to bee placed out of the Center of the world; the contrary of which we ſhall in this Chapter, God willing, ſufficiently demonſtrate. The motion therefore moſt called in queſtion, and moſt likely to bee found in the Earth rather then in the Heauen, is the Diurnall Reuolution performed in 24 houres from the Weſt to Eaſt: which (as we haue proued) being giuen to the Heauens would be farre ſwifter then nature can well ſuffer: wherefore with more probability may this motion bee taken from the heauens, and giuen vnto the Earth: The other without any abſurdity at all may be granted in the Heauens: Sith no repugnancy is found in nature, but that euery heauenly body may be furniſhed with ſome motion: and therefore *Copernicus* might haue granted the *Sun* and fixed Starres their ſeuerall motions as well as the reſt, which would haue ſeemed farre more probable then to haue endowed the Earth with a Triplicity of motion. Theſe things being thus opened, I will ſet downe their Theoremes.

1 *The Terreſtriall Globe is the Center of the whole world.*

To vnderſtand aright this propoſition, wee muſt conſider that a *Center* may be taken two manner of wayes : either *Geometrically*, or *Optically* : In Geometry it is taken for an imaginary point, conceiued in a magnitude deuoyde of all quantity, yet bounding and terminating all Magnitudes : *Optically* it is vſually taken for a ſmall and inſenſible Magnitude;becauſe to the ſight it may ſeeme no other then a *Point*; In which laſt ſenſe we may call the Earth the Center : For although the *Earthly Spheare* is endowed with a great and maſſie ſubſtance,yet (as we ſhall hereafter demonſtrate) in reſpect of the Firmament this greatneſſe would vaniſh into nothing. For if a man ſtanding in the Firmament ſhould behold it, it would ſeeme no other then as a ſmall point. This being declared, wee will produce theſe reaſons to proue the Earth to be the Center of the Vniuerſe. The Center, I ſay, not of all heauenly motions (for ſome Starres are moued vpon their own Center) but of the whole heauenly machine being collectiuely taken as one Body The firſt argument is of *Ariſtotle*, taken from the grauity or naturall inclination of all heauy bodies to the Center. The Earth (ſaith he) being a heauy & maſſie body, muſt needs ſeeke the loweſt place, which is fartheſt off from the Heauens. But this can be no other then the Center or middeſt point of the whole world. Which argument by others is more ſubtily vrged in this manner. Suppoſe the whole maſſe of the Earth were cut and diuided into many parts, equall the one to the other, of the ſame waight and figure : which parts ſo diuided were placed in diuers places vnder the concaue Superficies of the Moone, that they might be freely left to themſelues to moue according to their naturall inclinations : It is moſt certaine that all their parts being of the ſame nature, waight, quantity, and figure, would deſcend with the ſame motion, & in the ſame equall time, to the ſame place; which could in no wiſe happen, except they ſhould concurre in the Center of the world. But this reaſon, for ought I vnderſtand, is only probable, and not backt with any neceſſary demonſtration. For it proues not thing elſe but the Earth to bee the Center of all earthie and heauy bodies, and not to bee abſolutely placed in the exact middle of the world. Another reaſon not much vnlike the former, is drawne by ſome from a finall cauſe, and the naturall harmony of the parts of the world, one with the other: The Earth (ſay they) is of all other bodyes, the moſt vile, and ſordid: Therefore it is agreeable to nature, that it ſhould be placed in the middle, equally diſtant from each part of the Heauens, that one part might not ſeeme to complaine of this vnpleaſing vicinity more then another: But this reaſon takes as granted to matters, as yet not decided. Firſt, that the Earth, amongſt all other bodyes, is moſt vile and ſordid, depending on the ground of Peripateticks, that the heauenly bodies ſuffer no corruption, a thing ſooner ſpoken then proued. Secondly that pure and impure bodies, the moſt excellent and moſt vile in nature, are alwayes moſt diſtant, as in nature, ſo in place: which is a peremptory aſſertion without ground. A third reaſon more probable then the former, is drawne from the apparences of Starres aboue the Horizon: It is manifeſt that the Starres aboue the Horizon appeare alwayes to bee of one, and the ſelfe-ſame magnitude, and quantity, whether in the verticall point, or in the Eaſt, or the Weſt, or any other place: whence we may collect that they differ equally in diſtance from the Earth, and by conſequence the Earth is ſeated in the middle of the world: for if it were otherwiſe, that the Starres in ſome place ſhould bee neerer, in other farther off, they would ſome-where ſeeme greater, other-where leſſer, according to the grounds of the Opticks. This reaſon, howſoeuer popular, ſeemes to admit a two-fold exception. Firſt, becauſe it implies that a man ſtanding on the ſuperficies of the Earth is equally diſtant from all places and parts of the Heauens; whereas the heauens in the Horizon are farther diſtant, by reaſon of a whole ſemidiameter of the earth interpoſed. Secondly, all Starres ariſing in the Eaſt, or ſetting in the Weſt, ordinarily ſeeme greater then in the Verticall point, by reaſon of vapours aſcending and interpoſed. Whence wee cannot well gather the Earth to bee ſeated in the middeſt from the like apparence of the Starres, when experience teacheth the cōtrary, that they ſeeme not alwayes of the like magnitude. Concerning the firſt, we anſwer that the Semidiameter of the earth interpoſed betwixt the Superficies and Center, is in it ſelfe greater. But this (as wee ſhall proue) in reſpect of the Heauens is ſo little, that the ſenſe cannot gather any difference in obſeruation of the Starres, but that they ſhould alwayes appeare of the like magnitude. Concerning the ſecond, wee muſt needs acknowledge that vapours aſcending about the Horizon by an Opticall Refraction, make the Starres ſeeme greater then other wiſe they would doe. But the reaſon may bee vnderſtood in this ſort: that whether a man be placed in the ſame Horizon where the Sunne is when hee riſeth, or vnder that Horizou where the Sunne is now, vnder his Meridian, or vnder that horizon where hee is ſetting, hee will appeare to bee of one and the ſelfe-ſame greatneſſe without any ſenſible difference. Whereas therefore they ſpeake of the appearance of Srarres, they would haue them taken as abſtracted from all impediments of ſight or interpoſed vapours, and ſo the reaſon may obtaine her force. The fourth reaſon why the earth ſhould bee ſeated in the midſt, alleaged by *Ptolomie*, and others, is this: whereſoeuer any man ſtands on the Surface of the Earth, ſix ſignes of the Zodiacke will ſhew themſelues, and the other ſix ſignes will lye hid; and by conſequence halfe the heauens will appeare, the other halfe will bee vnder; which is an euident reaſon that the Earth is in the midſt, for otherwiſe it could not ſo happen. The former is confirmed by *Ptolomie*, *Alphraganus*, and the beſt Aſtronomers: the conſequence may bee inferred out of naturall reaſon. This argument will ſufficiently hold vpon this ſuppoſition mentioned before, and to bee proued hereafter: That the Earth hauing no ſenſible magnitude in reſpect of the Firmament, no ſenſible difference can ſhew it ſelfe betwixt the *Senſible*, and the *Rationall* Horizon. Beſides theſe reaſons, which make the matter more then probable: others are produced by *Ptolomie* demonſtratiue, not admitting any euident or probable exception or euaſion. The firſt is this; If the Earth bee placed out of the Center of the world, it muſt haue of neceſſity one of theſe three Sites or poſitions: Either it muſt be in the plaine of the Equinoctiall: or at leaſt it muſt bee placed, not onely without the plaine of the Equinoctiall, but without the Axell-tree: That is, to expreſſe it plainer; It muſt either bee placed beſide the Axell-tree, yet equally diſtant from both the Poles; or elſe it muſt bee on the Axell-tree, and ſo conſequently neerer to one Pole then the other: or thirdly, it muſt needs be beſide the Axell-tree, yet neerer to one Pole then another. If the firſt poſition were admitted, theſe abſurdities would of neceſſity follow. Firſt, that in a right Spheare there would happen no Equinoctiall, but onely in that Horizon which paſſeth by the Center of the world: for example ſake; let there be imagined a Spheare, BDCE, whoſe Center is A: let the Equator bee D E: the Axel-tree of the world B C: and let the Earth bee in F, the right Horizon HG not paſſing by the Center of the world A: which ſhall bee parallel to the Axis BC: ſince the Equator cuts the Horizon in right angles; It is moſt manifeſt that not only the equatour, but other parallells of the ſame will bee vnequally diuided of the Horizon: for as much as it paſſeth not by the Center or the Poles of the world: wherefore it muſt needs follow, that the dayes muſt continually be vnequall to the nights: which contradicts all experience; becauſe in a right Spheare the dayes are alwayes found to bee equall to the nights. Secondly, out of this poſition it would follow, that no man in a right Spheare



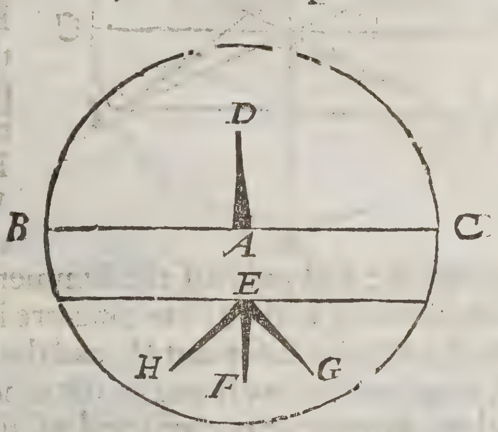
ſhould behold the halfe or hemiſpheare of the heauens, but either a greater or leſſer part, as may be demonſtrated out of the ſame Diagramme, whereas ſenſe can teſtifie that ſix ſignes of the Zodiacke are alwayes conſpicuous aboue our Horizon, and the other ſix alwayes hid: only excepting that Horizon which paſſeth by the Center of the Earth, wherein the Mediety of Heauen is conſpicuous. Thirdly, the ſame Starres in a cleere aire ſhould not alwaies ſeeme of the ſame magnitude; for if the earth be placed in the Equinoctiall plaine, and beſide the Axis of the world toward the Zenith or Meridian; the Starres which are in the Meridian will appeare greater then in the Eaſt or Weſt, becauſe they are neerer. But if it bee placed neere the Nadir or midnight point, they will appeare greater in the Eaſt or Weſt, then in the Meridian: if it ſhould bee placed towards the Eaſt or Weſt, the Starres would either ſeeme greater in the Eaſt then in the Weſt, or contrarywiſe, greater in the Weſt then the Eaſt: all which plainely contradicts experience. Moreouer it would hence follow out of this laſt, that the fore-noone would not be equall to the after-noone, for as much as the Meridian circle paſſeth by our verticall point, which in this caſe cannot bee in the middle of the hemiſpheare, but will decline more, either to the Eaſt or the Weſt. Fourthly, it muſt needs follow that in an oblique Spheare, either there will bee no Equinoctiall at all, or at leaſt, if there were any, it would not be in the midſt betwixt the two Solſtices of Summer and Winter; which is againſt all common experience. To explaine which aſſertion, let there be a Spheare ABCD, whoſe Center ſhall bee E: wherein wee will conceiue the equatour to be BD: the two Tropicks IL, and XH: the Axell-tree of the world AC: Now if the Earth ſhould be placed in the plaine of the equatour, out of the Axis of the world, as in F let there firſt be an oblique Horizon ZFY, cutting all the parallells into vnequall parts, and the Axis in thoſe parallells which are without: it is manifeſt that in the ſaid Horizon there will bee no Equinoctiall; becauſe the Horizon equally diuides in two halfes only that parallell which is deſcribed by P, which neuertheleſſe the Sunne neuer comes vnto, as neuer going beyond the Tropicke XH: Let there bee another



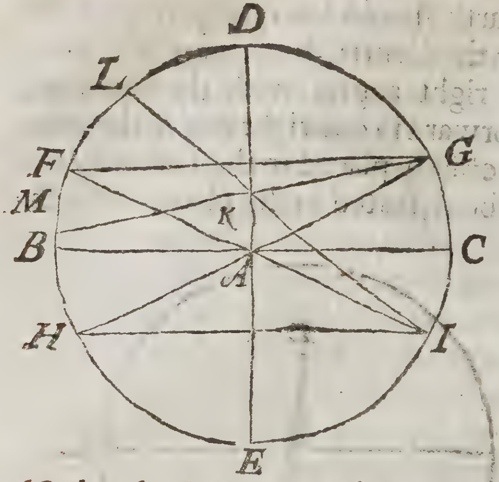
oblique Horizon OFM cutting the Axell A C within the ſaid parallels in N: It is manifeſt by reaſon, that there will happen an equinoctiall in the ſaid Horizon when the Sun ſhall deſcribe the parallell by N: becauſe this parallell is by the Horizon diuided into two equall partes. But this can in no wiſe happen in a middle ſpace and time betwixt the two Solſtices, for as much as the Equator only is equally diſtant and remoued from either Solſtice. It is alſo manifeſt, that the Sunne reſiding in B D the equator, there can bee no equinoctiall, but either after or before: which is abſurd and oppoſite to obſeruation. Fiftly, it will bee inferred out of theſe grounds, that no Horizon ſhall diuide the Heauens into two equall parts beſides that which concurres with the equinoctiall circle, as B D, and ſuch as are drawne by B D. Wherefore all people ſhould not behold the one halfe of the heauens. Sixtly, out of this opinion would neceſſarily bee concluded, that the exceſſe of the greateſt and longeſt day aboue the equinoctiall day, ſhould not bee equalized by the defect of the ſhorteſt day, by how much it is exceeded by the equinoctiall day: which is againſt all common experience; the conſequence ſhall appeare by demonſtration. Suppoſe A to be the Articke Pole: then will P G bee the exceſſe of the longeſt day X P aboue X G the Equinoctiall day. But K Q is the defect wherein the ſhorteſt day

I Q, is exceeded of the Equinoctiall day I K. All theſe abſurdities are auoided, if wee put the Earth in the Center E. for ſo in euery oblique Horizon, as in S R, will bee an Equinoctiall, the Sunne riſiding in the Æquator. 2 The Heauens will bee diuided into two equall halfes, and P G the exceſſe of the longeſt day, will bee equall to K V, the defect of the ſhorteſt day: whence wee may conclude the firſt part of this argument, that the Earth is not beſides the Axis in the plaine of the Equinoctiall. Concerning the ſecond poſition: if wee ſhould place the earth in the Axis of the world out of the plaine of the Equinoctiall, as many, or more abſurdities would of neceſſitie follow: for example ſake, let it be imagined in P: Firſt then no Horizon beſide a right would cut the Heauen into two equall parts or halfes, and conſequently the Zodiack. But this is proued falſe by experience (as we haue ſhewed) becauſe ſix ſignes of the Zodiacke are alwayes aboue and conſpicuous, and the other ſix vnder. Secondly onely vnder a right Horizon would there bee an Equinoctiall, becauſe only ſuch an Horizon equally diuides the Equatour into two halfes, as may bee ſeene in the former figure, in which the Equatour is conceaued to bee B D: the right Horizon A C. the oblique Y Z, cutting the Equator in F into two vnequall parts: Now if it ſhould happen that in any oblique Horizon, there ſhould bee an equinoxe, it could no wiſe bee in the middle time betwixt the two Solſtices, but would be much neerer to the one then to the other; as if the Earth were placed in N, betwixt the Tropicke X H, and the Equatour B D, there would bee an equinoxe when the Sunne paſſeth in the parallell by N. which parallell is farre neerer to the Summer Solſtice, then the Winter Solſtice. But if the Earth were in G, there would happen an equinoxe iuſt in the day of the Summer Solſtice; all which are moſt abſurd, and moſt repugnant to common ſenſe. Thirdly, this granted, the whole order and proportion of increaſe and decreaſe of dayes and nights, would bee confuſed and troubled. It is agreed on by conſent of all Coſmographers, that euery where without the right Horizon, there is ſuch an order and proportion of the increaſe & decreaſe of the dayes and nights, that twice in a yeere the dayes are equall to the nights, to wit, in the meane, or middle betwixt the longeſt and the ſhorteſt day, that the longeſt day is equall to the longeſt night, and the ſhorteſt day to the ſhorteſt night. That the exceſſe of the longeſt day aboue the Equinoctiall day, is ſo much as is the defect of the ſhorteſt day in regard of the ſaid Equinoctiall day. All which and many more ſuch Apparences would bee interrupted, were the Earth placed any where elſe then in the Center E, as will appeare by the Scheme. For the Earth being placed in E, euery oblique Horizon, as S R, will diuide the Equatour B D, into two equall hemicircles, ſo that ſo much ſhall appeare aboue as lies couched vnder, and ſo that day will bee equall to the night. In like ſort the Tropicks H X, and I L will bee diuided into two vnequall parts, yet ſo as the Alternate ſegments ſhall bee equall, to wit, P X and V L, alſo T H and V I, as it is demonſtrated by *Theodoſius, lib.* 2. *prop.* 16. Whence it comes to paſſe that the longeſt day X P is equall to the longeſt night L V, and the ſhorteſt day I V is equall to the ſhorteſt night H P. Finally, P G, the exceſſe of the longeſt day X P aboue the Equinoctiall day X G, is equall to K V the defect of the ſhorteſt day vnder the Equinoctiall day I K, which is ſhewed out of the ſimilitude and equality of the Triangles T E G, and V E K. Now of the contrary parts, if the Earth ſhould be placed in the Axis without the Center E, as in P, beyond all the parallells, no equinoxe can bee in an oblique Spheare (as wee haue ſhewed) but alwayes the dayes will bee longer or ſhorter then the nights. But if the earth bee placed in the point G, by which paſſeth the laſt of the parallells, there will be one only equinoxe, & that in the Solſtice in an oblique ſpheare in all other parts of the yeere the dayes would either be longer, or elſe ſhorter then the nights. But if the Globe of the Earth bee ſeated within the parallells in the point N, there would be two Equinoxes in a yeere, wherein the ſpaces of dayes and nights ſhould increaſe and decreaſe. Neuertheleſſe theſe increments & decrements ſhould neither in number nor in greatneſſe be equal to the increments and decrements of the nights, as may be gathered very eaſily by ſenſe, comparing the two Triangles, DNG, and QNK, becauſe that more and greater ſegments of parallels are comprehended in the Triangle LNK; then in the Triangle

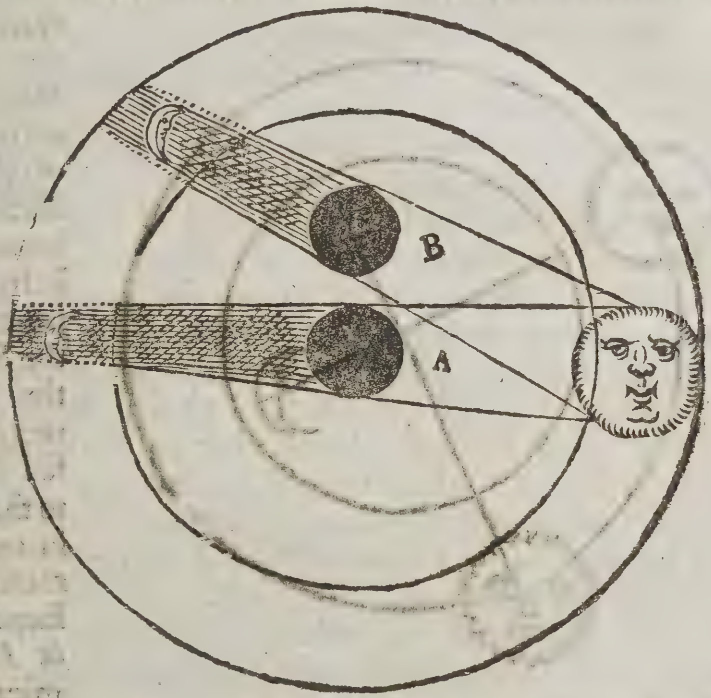
PNG. Fourthly, if the Earth ſhould vnequally reſpect the Poles, and were not placed in the Center, the ſhadowes of Gnomons erected which make right angles with the Horizon, ſhould not bee caſt directly forward in one right line in the time of the Equinoxes: the Sunne exactly placed in the Eaſt or Weſt: as for example: let the earth be A, ſeated in the plaine of the Equinoctiall circle B C and let there bee a Gnomon erected on the plaine of the Horizon, which is repreſented by the circle B C: It is manifeſt to ſenſe that the ſun ſetting in C, the ſhaddowes will be caſt in the oppoſite part towards B. Likewiſe the Sunne riſing in B will caſt his ſhadow towards C. But A C and A B, concurre in one right line, which plainely demonſtrats vnto vs, that the earth is ſeated in the plaine of the Equinoctiall. But if it were placed out of it towards either ſide, as in E, if a Gnomon be ſet vp on the Horizon as E F, wee ſhall ſee that the Sunne riſing in B in the time of the Equinoctiall, the ſhaddow will bee directed by the line E G, likewiſe the Sun ſetting in C, the ſhaddow will make the right line E H: But theſe two right lines being produced, will cut one the other in the point E, and therefore cannot concurre in the ſame right line, whereof ordinary experience witneſſeth the contrary. Fifthly, if the Earth were thus placed, it would follow by neceſſary conſequence, that two ſignes of the Zodiacke diametrally oppoſite, ſhould not be ſeene by a Dioptricke inſtrument: which is againſt experience which witneſſeth that the riſing and ſetting of the Sunne, may be ſeene by one right line: alſo the riſing in the Summer Solſtice and the ſetting in the Winter Solſtice, to anſwer to each other in one right line in euery Horizon: which could not bee performed vnleſſe the Earth were in the Equinoctiall plaine and the



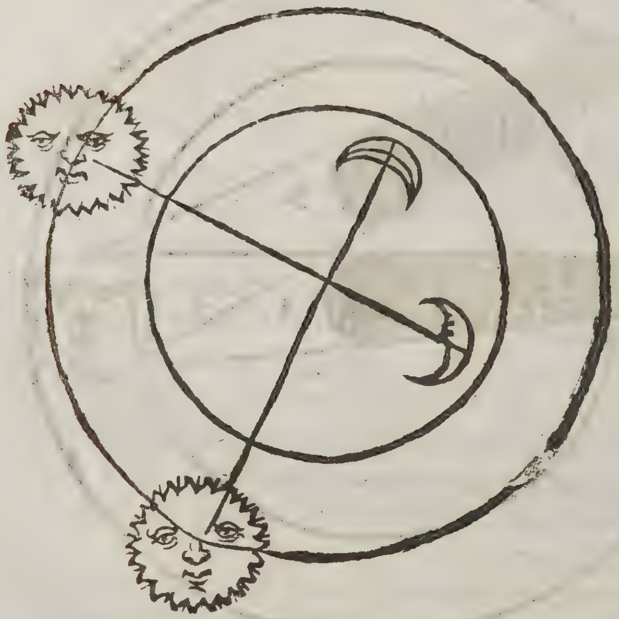
Center.



Center. Let there bee an Horizon B D C E, the Equator B C, the Axel-tree of the world DE, the Tropicke of Cancer F G, of Capricorne H I. Let the Earth firſt bee placed in the Center A: here may plainely bee perceaued that the Equinoctiall Eaſt B, and the Equinoctiall Weſt C, anſwer and concurre in the right line BC: alſo that the Eaſt point of the Summer Solſtice F, and the Weſt of the Winter Solſtice I, to concurre in the ſame right line F I, alſo the Winter Eaſt point H, and the Summer Weſterne point G, to anſwer mutually one to the other by the ſame line G H. Which Apparence is confirmed of all Aſtronomers. Now let the Earth be ſet in the Axis out of the Equatour in K: It is manifeſt to ſenſe that the contrary will alwayes happen: For the Winter point of the Sunne ſetting I, by a right line drawn from the Earth will not directly anſwer to the Summer point of riſing F, but to the point L. Likewiſe the Winter point of Sunneſetting G, will anſwer to the point M, and not to the Winter riſing H. Whence wee haue ſufficiently demonſtrated this ſecond poſition of the Earth beſide the Center of the World to be inconuenient, and no wayes to bee defended. For the third poſition that the earth ſhould be ſo remoued out of the Center, as that it ſhould neither be in the Equinoctiall plaine, nor yet in the Axell-tree. Wee need produce no other confutation, then what wee haue ſaid before of the other two poſitions. Becauſe out of this, the ſame or greater abſurdities would follow, then of the other, as any man may eaſily vnderſtand out of theſe demonſtrations wee haue before recited. The ſecond demonſtratiue reaſon, wherewith *Ptolomy* would confirme the Earth to be in the Center is drawne from the Ecclipſe of the Moone in this manner. If the Earth were not in the Center of the World, there would not alwayes happen Eclipſes of the Moone, when the two greater lights are diametrally oppoſed, but ſometime they would happen when theſe great lights are not reſiding in oppoſite places of the Zodiack; which is falſe, and againſt experience; for all Aſtronomers haue witneſſed, that eclipſes of the Moone then only are ſeene, when the Sunne & the Moone ſtand directly oppoſite the one to the other: becauſe then is the earth directly interpoſed. Now let the Center of the world be A, in which if the Earth bee placed, it is manifeſt that it then happens when the Sunne and the Moone are exactly oppoſed, and the earth interpoſed directly, which in this caſe cannot otherwiſe happen: But if the Earth bee placed beſide the Center of the world, as in B. Theſe things may fall out, that the two Luminaries may reſide in two oppoſite points of the Zodiack, and yet cauſe no eclipſe; becauſe the Earth is not in the ſame Diameter by the which they are oppoſed. Alſo the Moone will ſometimes ſuffer

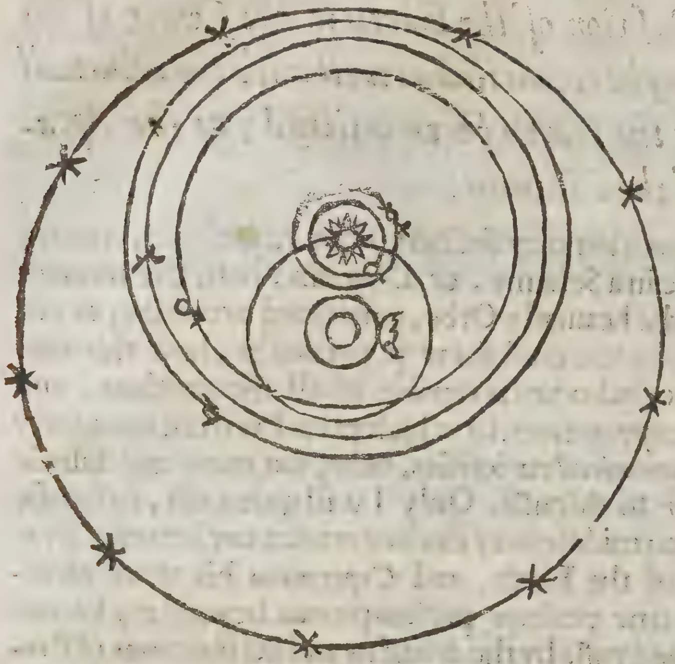


an Eclipſe, when ſhee is leſſe diſtant from the Sunne then a ſemicircle. In a word, this eclypſe is in places oppoſite. A ſemicircle will then only be ſeene when the Diameter of oppoſition ſhall paſſe by the Center of the Earth, and the world; all which are manifeſtly repugnant to experience and obſeruation. Out of this demonſtration of *Ptolomy*, *Clauius*, a later Aſtronomer in this ſort drawes the like concluſion. Let there be obſerued two diuers eclipſes of the Moon in diuerſe places of the Zodiack: Now becauſe each Eclipſe hapened when the Sun and the Moone were oppoſed the one to the other, in one Diameter (as Experience & Aſtronomicall ſupputations warrant) it muſt neceſſarily bee concluded that the earth ſhould bee in each of thoſe Diameters, and ſo by conſequence in the common ſection of them both: Sith then all the Diameters of the world concurre, and cut one the other in the Center: it muſt needs follow that the Earth ſhould bee in the Center and midſt of the World. Diuerſe reaſons there may bee drawne to proue this aſſertion. But theſe demonſtrations of *Ptolomy*, as I haue ſet them downe enlarged, and explained by our later writers, may ſeeme ſufficient, eſpecially in a matter of few called in queſtion.



2 *The Poſition of the Earth in the Center of the World may be reconciled as well with the Diurnall motion of the Earth forementioned, as the Apparences of the Heauens.*

That this propoſition may the better bee vnderſtood, wee are firſt to ſet downe in a Scheme, or Diagram, both the number and order of all the heauenly Orbs, conceiued according to our grounds. Secondly, we muſt ſhew in particular, how this ranging of the heauenly bodies is capable of all the motions, and apt to ſatisfy the apparences. In which parts I wil not too nicely deſcend to *Aſtronomicall* curioſities, being too many and ſubtile for a *Geographer* to diſcuſſe. Only I will giue a taſt, to ſatisfie ſuch as ſuppoſe no middle way can bee troden out betwixt *Ptolomies* ſtability of the Earth, and *Copernicus* his three Motions. I might ſeeme perhaps preſumptuous beyond my knowledge, to reiect and paſſe by the draughts and delineations of *Ptolomy*, *Alphonſus*, and their followers, which are commonly defended and in vſe: or that other of *Copernicus*, ſupported with the authority and credit of ſo great an Aſtronomer: or that of *Tichobrahe* more corrected then either, and to preferre my own, being an Embrion, or halfe faſhioned. To this I anſwer. Firſt, that I only expoſe this Scheme following to the view of the iudicious, iuſtifying it no farther then will ſtand with *Aſtronomicall* obſeruation. Secondly, I herein arrogate little or nothing to my ſelfe; for as much as I haue digeſted, and compounded it out of the obſeruations and experiments of late Aſtronomers, and only collected together what they ſcattered; The Scheme it ſelfe is expreſſed in this manner; wherein to beginne from the loweſt: The Center is the Globe of the *Earth*, to which wee haue giuen a *Diurnall* motion from the Weſt to the Eaſt vpon her owne Poles, whoſe Reuolution is made in 24 houres: About the Earth as the Center of the whole world, the Moone is carried in her circle, which amongſt all the Planets, is found more neerely to reſpect the Earth, as well in place as nature. Next ſucceeds the Sunne, as the leader of all the Planets, which carried



ried round about the earth in an *Annuall* circuit, deſcribes the *Ecliptick* circle: about the *Sun* as the proper Center, are all the Planets moued except the *Moon*. The two immediate cõpanions of the *Sun* are *Venus*, & *Mercurie*, which ſo cõpaſſe him about, that the *Earth* neuer comes betwixt them and the *Sunne*. The other three Planets, as *Mars*, *Iupiter*, and *Saturne*, howſoeuer they enuiron the Sunne as their proper Center; yet ſo as within their circles, they comprehend the body of the Earth: The Planet *Mars*, becauſe hee is found by Aſtronomers, to moue ſometimes aboue, ſometimes vnder the Sunne, is vnderſtood to moue in ſuch a circle, which on the oppoſite ſide ſhall cut the circle of the Sunne: yet ſo as *Mars* and the *Sunne* can neuer meet in one point: Foraſmuch as *Mars*, as well as the other Planets, is ſuppoſed to be carryed in an Epicycle about the Sunne, and to keepe an equall diſtance from him howſoeuer moued: Neither is he euer found vnder the Sunne, but about the time of the oppoſition, as Aſtronomers obſerue: whence a cauſe hath beene giuen, why *Mars* ſhould appeare greateſt at the time of *Oppoſition*. Theſe fiue Planets, to wit, *Saturne*, *Iupiter*, *Mars*, *Venus*, and *Mercury*, may bee conſidered according to a double motion: The one is proper and naturall, wherein they are moued about the *Sunne*, as their proper Center: The other Accidentall, and as it were by a conſequence of Nature, whereby by in their circuit mouing about the *Sunne* as their Center, they muſt of neceſſity, by a conſequent ſite of the place, be carryed about the *Earth*. For the Sunne placed in his *Eclipticke* line, ſo compaſſeth round the Earth, that with him hee is ſuppoſed to carry the *Epicycles*, wherein theſe Planets are moued round about him. Whence wee finde the motion of theſe Planets about the *Sunne*, as their owne Center, to bee regular, but about the Earth irregular: which proceeds from their *Excentricity* in reſpect of the Earth. Aboue all the Planets wee place the *Firmament*, or Starry Heauen, hauing a very ſlow motion, not to bee finiſhed in many thouſand yeeres, and this motion is on other Poles then the Poles of the world, to bee ſought out in or neere the Poles of the *Eclipticke*. This Heauen would *Ariſtotle* haue to bee the firſt moueable, and therefore gaue it a very ſwift motion, which is the ſame which wee call *Diurnall*, and haue giuen to the Earth. But it ſeemes more conſonant to nature, that the ſlower motions ſhould agree to the higher bodies: and the ſwifter to the lower, that there might be a proportion, betwixt the time and the ſpace of motion: It remaines that wee probably ſhew that out of their ſuppoſitions, the Celeſtiall Apparences may bee as well or better ſalued then by the ordinary grounds. The Apparences which are moſt called in queſtion, concerne either the *Motion*, or the *Places*, and Poſitions. All the reſt are either of leſſe moment, or at leaſt are thereunto reduced. Euery motion which is found or thought to bee found in the Heauens, is either the *Diurnall*, or *Periodicke*. The *Diurnall* Motion (as wee haue already ſhewed) belongs to the Earth, which according to our grounds is ſuppoſed to moue from the Weſt vnto the Eaſt in 24 houres, Which may anſwer to the Motion of the firſt moueable Spheare; which according to *Ariſtotle*, is the Starry Firmament, and thought to moue from the Eaſt to the Weſt. The *Periodicke* Motion, is either a ſlower Motion, to be finiſhed not vnder many thouſand yeeres, or elſe a ſwifter Reuolution of the Planets. This ſlow motion the common Aſtronomers would haue towfold: The one from the *Weſt* to the *Eaſt* on the Poles of the *Eclipticke*: the other a Motion (as they call it) of *Trepidation*, from the *South* point to the *North* and backward againe: but one ſlow Motion of the fixt Starres vpon the Poles of the Eclipticke, granted to the Firmament, will (for ought I ſee) ſatisfy both. The reaſon why they put two diſtinct Motions, is, 1 Becauſe they haue obſerued the Starres of *Aries*, *Taurus*, and the reſt of the *Zodiacke*, not to be ſeated in the ſame place wherein they were anciently found; but to be moued certaine degrees from the Weſt towards the Eaſt. Whence they would conclude a Motion to bee from the Weſt vnto the Eaſt. 2. It will ſtand with no leſſe experience, that the foreſaid Starres of the Firmament haue moued themſelues from the South towards the North. To paſſe ouer the reſt, the *Pole-ſtar*, which in *Hipparchus* time was diſtant from the Pole about 12 Degrees, is now obſerued to approach almoſt three degrees. Theſe two Motions, ſhould they bee eſteemed in the account of Aſtronomers might ſeeme deficient. Notwithſtanding wee may probably coniecture this to bee no other then one, and the ſelfe-ſame Motion vpon the Poles of the *Eclipticke*: Whence it may come to paſſe, that the fixt Starres are not only carryed from Weſt to Eaſt, but alſo by reaſon of the obliquity of the *Eclipticke* line, encline more and more dayly to the Pole of the *World* whence they may againe returne. For this motion from the Weſt to the Eaſt, is of the primary intent of nature, wherein the Starres moue in circles parallell to the *Eclipticke*: But from the North to the South, as by the neceſſary conſequence of the poſition and obliquity of the *Zodiacke*: becauſe it cannot bee auoided, but that it ſhould either incline to, or decline from the Pole. If they ſhould obiect (as many doe) that this progreſſe is not proportionall in reſpect of the time according to the calculation of the Aſtronomers. Wee anſwer. 1. That this difference is ſo ſmall, that it ſhould rather ſeeme to bee imputed to the negligence or ignorance of ſuch as tooke theſe obſeruations, then to any diuerſity of motion. For who knowes not in theſe dayes of ours, wherein this art is arriued at a farre greater perfection, diuerſe Aſtronomers in obſeruing the ſame Star at the ſame time, to differ much the one from the other: Whoſe knowledge notwithſtanding, is fortified with the experience of the Ancients, and inuention of new Inſtruments. What then ſhall wee thinke of thoſe, which diſtant ſo many ages in time, and vſing diuerſe & vnlike Inſtruments in their obſeruations, haue differed in matters of ſo ſmall moment: chiefly in ſeeking out the period of this long and ſlow motion, which by reaſon of his ſlownes, ſince the time it was known to man, hath not ranne the fifteenth part of his circle. For my part, I ſhall rather aſcribe it to the errour of their obſeruations, then multiply Orbs without a greater cauſe. Firſt, becauſe (as wee haue ſaid) the difference is ſo ſmall, and almoſt inſenſible 2. Becauſe wee haue beene taught by our Aſtronomicall hiſtories, what kinde of Inſtruments were then in vſe, which to later Aſtronomers haue beene thought too rude and vnfit to make ſuch ſubtile obſeruations. Laſtly, concerning the *Site* and *Poſition*, no leſſe reaſon may bee giuen out of our *Hypotheſis*, then the common way. For by placing the fiue Planets to runne in their Epicycles about the Sunne, may we giue a reaſon of the inequality of their diſtance from the Earth, wherein an ingenious minde in our common grounds can hardly giue himſelfe ſufficient ſatisfaction.

3 The *ſtability* is an affection whereby the Terreſtriall Spheare is firmely ſetled in his proper place.

The *Stability*, or firmeneſſe of the Earth which we here vnderſtand, 1. No way denyes or contradicts the motion of the parts of the Earth, whereby being ſeparated, they returne to their proper place. 2. Neither the circular Reuolution of it on her owne Poles and Axell, whereof wee haue formerly ſpoken. But either ſuch a motion whereby the parts of it may bee ſeuered one from the other, and ſo the whole Maſſe diſſolued; or whereby the Center of the Earth may be moued out of his proper place; or at leaſt ſuch as might mooue the Poles of the earth from their true verticity, whereby they ſhould not reſpect alwayes in the Heauens the ſame points or poles. Which kinde of ſtability from motion we will eſtabliſh in this Theoreme.

1 *The Earth is firmely ſeated and ſetled in her proper place.*

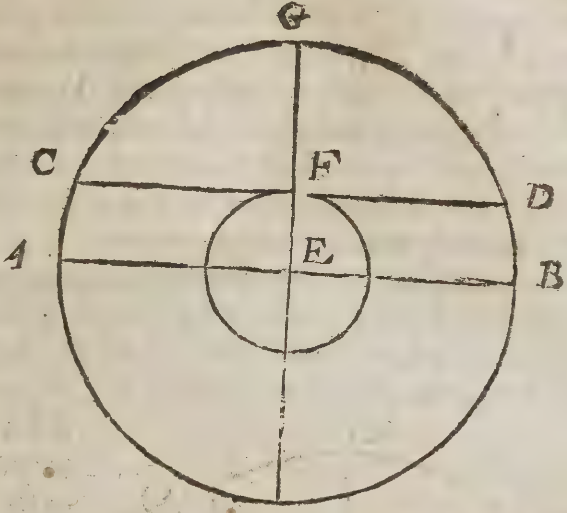
This Theoreme may bee proued as well by reaſon, as authority of holy Scripture: From reaſon it is demonſtrated in this manner. If the Earth ſhould not be ſetled in her proper place, this would of neceſſity happen; either by diſſolution and ſeparation of the parts one from the other: or by remouing the poles out of their fixt places: or elſe by motion of the Center from one place to the other. The firſt cannot be admitted; becauſe (as we haue before taught in the ſecond Chapter of this booke) All *Terreſtriall* Bodies are endowed with an inclination or ponderoſity to approach as neere as they can to the Center of the Earth; ſo that by this coherency and conformity, the whole earth is ranſom'd from any ſuch mutability. Neither can the whole Spheare bee diſſolued without an eſpeciall miracle: And if ſo it ſhould happen, the parts would returne againe, and conforme themſelues to compoſe the ſame Spheare. Likewiſe the ſecond way; The earth cannot looſe her ſtability, becauſe (as wee haue ſhewne in our former Chapter) the earth hath her two Poles magneticall made faſt vnto the Poles of the world, as if they were bound firmely to two great pillers, neuer to bee ſhaken. Finally, The Center of the Earth cannot be moued out of his place any wiſe, becauſe, as we haue demonſtrated in the Chapter before, without the diſturbance and inuerſion of the whole frame of Nature the Earth can haue no other place then the Center or middeſt of the whole world. Some haue alleaged as an argument that principle of *Ariſtotle: That one ſimple Body can haue but one ſimple Motion:* and therefore the earth challenging to it ſelfe a right motion to the Center, cannot alſo haue a circular or round motion, and ſo of neceſſity muſt reſt vnmoued in her proper place. But this reaſon, as I haue ſhewed, is weake to proue this aſſertion. Firſt, becauſe this principle of *Ariſtotle* is not grounded on certainty, but contradicts experience, as I haue elſewhere ſhewed. 2. This right motion to the Center is not to bee aſcribed to the *whole*, as the immediate ſubiect, but to the *parts* of it ſeparated from the whole; ſo that nothing will hinder, but that the whole Globe may haue a motion proper to it ſelfe on his owne Poles. But to let this reaſon paſſe as weake; all thoſe arguments alleaged by the common Aſtronomers, and Philoſophers againſt the circular motion of the Earth proue indeed no other matter then this ſtability which we eſtabliſh : but if racked any farther come ſhort to ſatisfie. For authority of Scripture, many places are vrged to proue this ſtability; whereof wee haue a pregnant place in 104 Pſalme, wherein *David* magnifying the Creator, ſaith *That hee laid the foundation of the Earth ſo ſure, that it ſhould not be moued at any time :* To which may be added many other Texts, but that I hold this one ſufficient in a matter which few men call in queſtion. Wee are in the third place to treate of the proportion of the Earth, with the heauenly bodies.

4 The *Proportion* is that wherein the quantity of the Terreſtriall Globe is compared with the quantity of the Heauens.

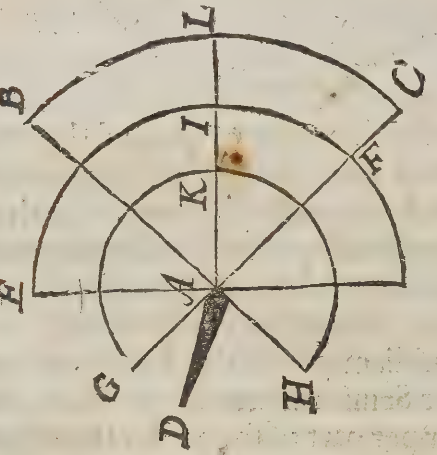
We muſt here remember a diſtinction before touched, that the Globe of the Earth may bee conſidered two wayes; either *Abſolutely* in it ſelfe, or *Comparatiuely* in reſpect of the heauenly Bodyes. If we conſider it abſolutely in it ſelfe, wee ſhall finde that the Earth hath a vaſt and huge magnitude, and not any wayes to bee compared to a point; becauſe it is a body, and therefore ſubiect to diuiſion, whereas a point is conceaued as an indiuiſible ſigne admitting no parts at all. Secondly, becauſe the magnitude of the Earth many times taken, will meaſure the greatneſſe of the Heauens, as wee may obſerue by Aſtronomers who meaſure the magnitude of the greateſt Stars by *Diameters* and *Semidiameters* of the Earth : whereas a point of it being a thouſand times multiplied, will neuer beget a magnitude or meaſure of the quantity of any Body. Thirdly, the Starres are not as meere points in reſpect of their Orbs, becauſe they ſenſibly are ſeene, as parts of theſe Orbs. But the Earth is greater then ſome of the lower Starres, as the *Moone*: Whence we may with good grounds auerre, that if a man were placed in the *Moone*, hee might behold the *Earth* far greater then the Moone being obſerued by vs in the Earth. Wherefore no man can deny but the Earth in it ſelfe hath a great vaſtneſſe But if wee conſider this greatneſſe in reſpect of the Heauens, we ſhall find this vaſt greatneſſe to ſhrinke almoſt into nothing, and become as a meere point without ſenſible magnitude. But this is not altogether generall without limitation; becauſe the heauenly bodies are diſtinguiſhed into the higher and greater, ſuch as are the *Firmament* with the foure higher Planets, ſuch as are *Saturne*, *Jupiter*, *Mars*, and the *Sunne*: or the lower and leſſer, ſuch as are *Venus*, *Mercurius*, and the *Moone*, which difference in place and greatneſſe admits a great diuerſity in this proportion, as wee ſhall ſhew in theſe two Theoremes.

1 *The Earthly Globe compared in quantity with the* Firmament *and ſuperiour Orbes of the planets, hath no ſenſible magnitude.*

This Propoſition is ſupported not only by the authority of many and graue Authors, as *Ariſtotle*, *Ptolomy*, *Pliny*, *Alphragan*, and others: but by diuers ſtrong reaſons drawne from experience and obſeruation of Aſtronomers. The firſt argument ſhall be this, which is moſt popular. The *Sunne* and many other Starres in the Firmament, are found out by Aſtronomicall Inſtruments to bee manifold greater then the Globe of the Earth: yet appeare they in reſpect of the heauens but as a little point or portion. Then muſt the Earth, being in compariſon far leſſer, be deuoyd of all ſenſible magnitude or proportion. Secondly, if the Earth had any notable quantity in reſpect of the Heauen, then muſt the *Diameter* of the earth haue as great a quantity in reſpect of the *Diameter* of the Sky; for there is the ſame proportion of the Diameters which the circumferences haue one to the other, as is demonſtrated in Geometry. Now if the Diameter of the Earth hath any notable magnitude in cõpariſon of the Diameter of the Skye, then the Starres which be ouer our heads, be neerer vnto vs by a notable quantity, then when they bee either in the Eaſt or Weſt. For it muſt needs follow that the Starres placed in the verticall point, are neerer by the *Semidiameter* of the Earth, then when they are either in the Eaſterne or Weſterne point, as we ſee in this figure here ſet downe ACDB, wherein I make E to be the Center of the Earth, AEB the true Horizon, and E F the Semidiameter of the earth. Now if the Semidiameter F E haue any ſenſible proportion, then muſt G the



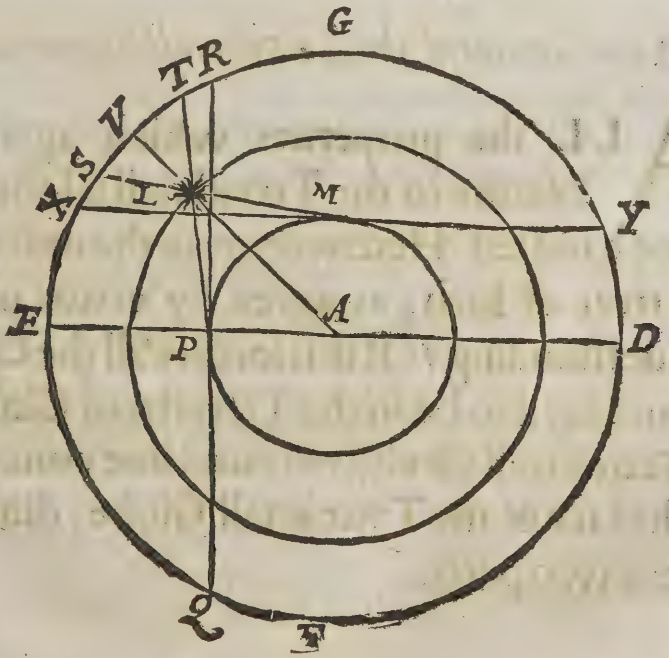
the verticall point be neerer to F then either A or B. ſuppoſed to bee the Eaſt & weſt points; becauſe E A, or E B, are the whole *Semidiameter* of the Celeſtiall circle, whereof F G is only a part. But contrarywiſe there is no ſuch diuerſity perceiued in the magnitude of the Starres, but that they appeare ſtill to bee of one and the ſame greatneſſe, except by accidentall interpoſition of vapours and groſſe bodies: wherefore it muſt of neceſſity follow, that their diſtance is all one in all parts of the Skye, and by conſequence the Semidiameter of the earth hath no ſenſible diuerſity in diſtance. Thirdly, hence would ariſe another reaſon no leſſe forcible then this; that if the Semidiameter of the Earth had any compariſon or proportion to the Semidiameter of the Skye, the Horizon that we haue on the vpper part of the earth, ſhould not diuide the Skye into two equall parts; for as much as the part which is couched vnder the Horizon, would alwayes be greater, and the other leſſer, as in our former Diagramme: if E F haue a notable quantity in compariſon of E A: then will the line C F D, being the Horizon on the top of the earth, differ notably from the line A E B, being the Diameter of the World, and the Horizon to the Center of the Earth: and ſo ſhall not the Horizon C F D, diuide the world into two equall parts, but the vpper part ſhall alwayes be leſſer then the lower, which croſſes ordinary experience: for we may ſee in long winter nights, that thoſe Starres which are in the Eaſt Horizon, in the beginning of the night, will be in the Weſt at the end of twelue houres: and contrarywiſe, thoſe Stars which did ſet in the Weſt, when thoſe



others did riſe in the Eaſt, ſhall riſe agayne when the other ſhall ſet. Fourthly if the earth had any ſenſible greatneſſe in reſpect of the Heauens, then were it vnpoſſible for any Sunne Diall to bee regular and obſerue due proportion. For we ſee the ſhaddowes to moue as duely and orderly about the Center of Dials and ſuch inſtruments, as if their Center were the very Center of the world: which could neuer happen if theſe two Centers ſhould differ notably in reſpect of the Spheare of the Sunne: to expreſſe it the better we will ſet this Figure, which repreſents the three notable circles in a Diall, which are deſcribed by the courſe of the Sunne in three notable places of the Zodiacke, to wit, the two Tropicks, and the Equinoctiall. Herein the vttermoſt arch B L C repreſents the Tropicke of *Capricorne*, and is deſcribed no greater then the quarter of a circle, becauſe the Sun placed in the Signe, ſhines vnto vs but ſix houres. The Equinoctiall is ſet as halfe a circle, becauſe the Sun being in it, appeares vnto vs 12 houres, & is here noted out by E I F. The Tropicke of *Cancer* containes 3 quarters of a Circle, becauſe when the Sun is in it, there are eighteen houres from Sun-riſing to Sun-ſet: and that circle is G H K. The Center of the Diall is A, and the Style which giues the ſhadow D A, whoſe top being D, doth deſcribe thoſe portions of circles with ſuch exactneſſe, as if the Diall were ſet in the very Center of the Earth, and the diſtinction of the houres ſhewes it ſelfe no otherwiſe then if the Center of the Diall were the ſame with the Center of the world. To theſe arguments I may adde, that if there ſhould bee a ſenſible greatneſſe of the earth in reſpect of theſe ſuperiour Orbes, either all or moſt of theſe abſurdities would ariſe which follow their opinions, who place the Earth out of the Cēter of the World, which we haue before treated of.

2 *The Terreſtriall Globe compared with the inferiour Orbs hath a ſenſible magnitude.*

Although the whole Earth compared with the Firmament and ſuperiour Orbs of the Planets, ſeeme no otherwiſe then a point: yet from this wee muſt except the Orbes of the lower Planets *Venus*, *Mercury*, but eſpecially the *Moone*: Who are found by obſeruations of diuerſe skilfull Aſtronomers to haue a ſenſible and notable greatneſſe in reſpect of the earth, whereof a manifeſt argument may bee drawne from the Parallax or variation of the ſight: wherein our obſeruations of the ſame Starre at diuerſe places are not the ſame, though at the ſame time: neither will ſuch a Starre to both places ſeeme in the ſame point of the Heauens; which could not poſſibly bee, except we admit a ſenſible difference betwixt the *Rationall* and *Senſible Horizon*; and ſo grant the Earth, in reſpect of ſuch Orbs, ſome quantity and greatneſſe. This diuerſity of Aſpect, which they call the *Parallax* may be ſeene in this Figure: let A be the Center of the Earth, L the Moone, or other Starre to bee obſerued,



EGD,

E G D, the *Firmament* or Orbe of the fixt Starres : ſuppoſe then the eye to be in the fixt point M of the ſenſible *Horizon* X M Y the ſaid Planet will appeare in the point of the Firmament S, according to *Opticall* principles, whereby all things are ſayd to be ſeene in the place directly oppoſite. Suppoſing againe the Eye to be in the point P of another ſenſible Horizon R P Q, the Starre L will no doubt appeare in the oppoſite point T. Neither of which meets with the Starre in the right place. For imagining the Eye to bee placed in the Center A, the place of the Starre would bee V; which is his true place. Theſe differences of ſight could finde no place if the Earth were as a meere point and challenged no ſenſible Magnitude, in reſpect of theſe inferiour Planets: and yet experience of Aſtronomers hath ſufficiently confirmed it. But this being a point very curious, and appertaining to Aſtronomy, I leaue it to their farther induſtrie, whoſe profeſſion it vndergoes.

CHAP. VI.

Of the Circles of the Terreſtriall Spheare.

1 ALL the properties which agree by Nature to the Terreſtriall Globe, we haue handled. Here wee are in the next place to treat of ſuch, as agree by vertue of our vnderſtanding: Of this ſort are all the Circles conceaued to be in the Terreſtriall Globe.

2 A Terreſtriall Circle is a round line conceiued in the face of the Terreſtriall Globe, diuiding it into two parts.

A Circle is conſidered two manner of wayes: either abſtracted from this or that ſenſible matter, in which ſort it is ſuppoſed to bee taught in *Geometry*; to which properly appertaines the knowledge of the *Fabricke* and *Meaſure* of all Magnitudes, eſpecially of this, being amongſt all, the moſt perfect and exact: Or elſe a circle is conſidered ſo far forth as it hath ſome ground in the Nature of the Earth, at leaſt by application of the Celeſtiall Globe, and ſo it comes into the conſideration of *Geography*. For concluſions demonſtrated and proued in *Geometry*, are here to be admitted as principles ſuppoſed not demonſtrated a new: which *Logicke*, if *Clauius*, *Blancanus*, and other ſuch writers had well learned, they would not haue ſtuffed out their worke with ſuch *Heterogeneall* mixtures, but haue reduced euery thing to his proper ſeat and ſcience. A circle as well by the *Geographer* as *Aſtronomer* is diuided into foure quadrants, each quadrant into 90 degrees, all which make vp 360. So that a degree is the 360 part of a Circle, which I only mention as being of chiefeſt vſe with vs, yet ſuppoſed to bee handled and taught in a higher ſcience.

1 *A circle though imaginary in it ſelfe, hath his ground in the Nature of the Earthly Spheare.*

As in *Logicke* men haue inuented certaine Intentionall Notions, ſeruing as ſo many inſtruments to direct and regulate our vnderſtanding in the apprehenſion of things: So in *Coſmographie* can there not be wanting ſuch imaginary ſignes and circles to confirme and ayde our phantaſie. And as in *Logicke* ſuch Notions in themſelues are meerely imaginary and intentionall, yet may be tearmed reall, ſo farre forth as they are grounded in the things themſelues; ſo may we ſpeake of theſe circles conceiued in the face of the Terrene Globe: which wee are not to conceiue to bee fictious and imaginary, as if they had no ground at all in nature. For although there bee no ſuch circles painted on the face of the Earth, as wee finde in an artificiall Spheare: yet muſt wee of neceſſity conceaue ſuch reall reſpects to bee in the Earth it ſelfe: as when a Ship ſayles ouer the Ocean, it cannot bee ſaid to leaue behind any viſible marke or Character in the ſurface of the water; yet in regard it made a reall paſſage, it will leaue a line conceiuable, ſigning out vnto vs the true paſſage. It is a matter which hath not a little troubled *Coſmographers*, to finde out the immediate and true ſubiect or ground of theſe circles; whether they ſhould be immediatly taken from the earth, or elſe in the Heauens. The ancient Coſmographers haue acknowledged no other ground of theſe Circles; then the congruity and application of the celeſtiall Globe, and his parts with the parts of the Earth: but our Magneticall Philoſophers more neerely ſearching into the nature of the Earthly Spheare haue found theſe Circles all (except the Horizon) to wit, the *Meridians*, and *Parallells*, to bee immediatly grounded in the Earth it ſelfe: whoſe opinion we cannot reiect, as being ſupported by experimentall demonſtration, as wee ſhall ſhew in particular.

2 *The diſtinction of a circle into any certaine Number of parts, hath no certaine ground in the Nature of the earthly Spheare, but only inconneniency; leauing our iudgements free, to take ſuch a Number as may beſt ſerue our purpoſe.*

Some Aſtronomers more curious then wiſe, haue gone about to ſeeke a ground of this diſtinction of a circle into 360 parts out of the Sunnes courſe in the *Zodiacke*, a Circle (ſay they) by the opening of the Compaſſe, being deſcribed in a plaine, is diuided into ſix equall parts. Now becauſe the Sunne being the rule and meaſure of all perfect motions, paſſeth through one ſixt part in 60 dayes, the whole Circle was diuided into 360, for 60 multiplied by 6, will produce that number. But this reaſon ſeemes to infer nothing concerning any naturall ground, that this diſtinction ſhall finde in the Earth, though it may ſerue as an argument of Conueniency, the number 360 being fitteſt for that calculation. Another reaſon very like the former, is drawne from the coniunction of the Sunne with the Moone, which happens 12 times in a yeere: and becauſe from each coniunction to that which followeth are ſpent 30 dayes; Hence it is that the Zodiacke is firſt diuided into 12 parts, which multiplied by 30 will produce 360. This reaſon likewiſe proues only thus much, that it is the fitteſt number to calculate the Motion of the Sun in his Eclipticke: Not that this diuiſion hath any ground in Nature more then other, becauſe being a continuate quantity, according to Philoſophy, it may ſuffer infinite diuiſions: for it was in the beginning left free to Coſmographers, to chooſe what number they pleaſed to expreſſe the parts or ſections of a Circle: which they tooke (as it ſeemeth) not meerely from the motion of the Sunne, but from their conueniency, and commodity, finding this number moſt commodious for the diſtinction of euery Circle. The reaſon was, becauſe no number could bee found, which ſuffered more parts and diuiſions then this. For as much as in 60, whereof 360 by multiplication is produced, hath exactly theſe parts 1. 2. 3. 4. 5. 6. 10. 12. 15. 20. 30. Likewiſe 360 hath exactly 1. 2. 3. 4. 5. 6. 8. 9. 10. 12. 15. 18. 20. 24. 30. 36. 40. 46. 60. 72. 90. 120. 180. Of all which parts there is ſo great vſe in Aſtronomy and many times in Geography, that without it there would be ſmall exactneſſe. For as we ſee a yard meaſure would little ſteed the Mercer or Clothier, except it were againe diuided into ſmaller parts: ſo fals it out in the account of the Coſmographer.

3 Of the Terreſtriall Circles, ſome are *Abſolute*, ſome *Relatiue*: the Abſolute are ſuch as are aſſigned without any reſpect to our ſight, of which ſort are the Meridians and Parallells.

4 The Meridian is a circle drawne by the Poles of the world and the verticall point of the place.

The Meridian Circle is ſo called of *Aſtronomers*; becauſe when the Sun (according to their ſuppoſitions) by the motion of the firſt moueable comes into this Circle, it makes mid-day: and then hath been running his courſe from his riſing to arriue there iuſt ſo long as he ſhall be mouing from thence to the place of his ſetting. In this Meridian are placed the two Poles of the Equator, which are the ſame with the Poles of the world; in this alſo are the verticall point and the point oppoſite vnto it, tearmed the Poles of the Horizon, whereof we ſhall ſpeake hereafter. So that ſo many Meridians are imagined to be in the Earth, as there are vertical points: for howſoeuer we ſee not many Meridians painted on the face of the artificiall Globe, yet muſt there be ſo many imagined in the reall Earth as *Zenithes* and *Horizons*: ſo that it is impoſſible for a man to moue neuer ſo little from Eaſt to Weſt, without changing his Meridian: yet for more order ſake haue the Coſmographers reduced the number of Meridians to halfe the number of the degrees in a Circle, to wit, to 180, that euery Meridian cutting the Equator, and other Parallels in two oppoſite places, ſhould anſwer to two degrees in the ſame Circle. By which it appeares, that euery Meridian diuides the Terrene Globe in two halfes, whereof the one is reſpectiuely tearmed of the Eaſt, the other of the Weſt. But to auoid all ambiguity of ſpeech, we ought to conſider that a Meridian is twofold; either the true Meridian, or Magneticall Meridian. The true Meridian, ordinarily ſo called, is that which directly paſſeth by the Poles of the World; of which wee here treat, which indeed (as wee ſhall ſhew) is the onely true magneticall Meridian. But that which ſome haue falſly called the Magneticall Meridian, is that which runneth by the Poles of the Magneticall Variation, and much differs from the true; becauſe (as we haue taught) the variation is diuerſe according to the diuerſity of places, & therefore cannot anſwer in any certaine proportion to the Poles of the Terrene Globe. The true Meridian Circle, as it hath manifold vſe in Aſtronomy, namely to diſtinguiſh mid-day, and midnight, to meaſure the riſing and ſetting of the Starres, &c. matters not to bee neglected of Geographers; ſo hath it a more ſpeciall vſe in Geography: to deſigne the longitudes and latitudes of the places, with their diſtances, with many other matters treated of hereafter.

5 Concerning the Meridian circle wee are to know two things. The *Inuention* of it, and the *Diſtinction*: The inuention is whereby wee are taught to find out the true Meridian in any place aſſigned.

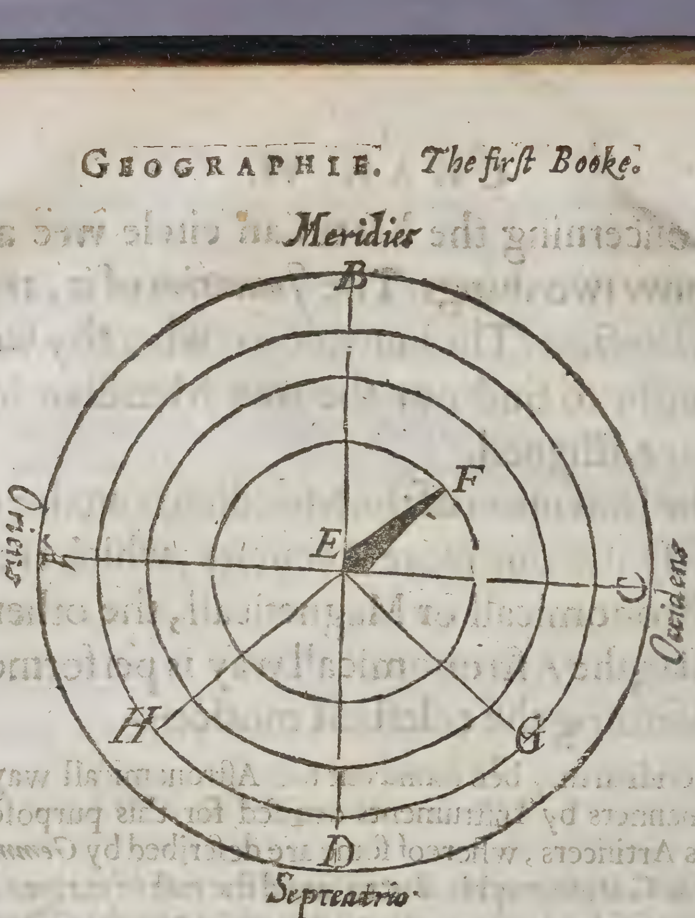
6 The Inuention of the Meridian is againe twofold: the one more Accurate, which is either Aſtronomicall or Magneticall, the other Popular; the Aſtronomicall way is performed by obſeruing the celeſtiall motion.

The Meridian may bee found out the Aſtronomicall way in diuerſe manners by Inſtruments deuiſed for this purpoſe by ingenious Artificers, whereof ſome are deſcribed by *Gemma Friſius* in his Coſmographie. But to auoid the coſt of curious Inſtruments, I will ſet downe our way, depending on this Theoreme.

1 *If two ſeuerall Sunne-ſhadowes bee obſerued, the one in the fore-noone, the other in the after-noone of the ſame day exactly to touch with their ends, the Circumference of the ſame circle deſcribed in a Plaine, Parallell to the plaine of the Horizon: The line from the Center equally diuiding the Arch of that Circle betwixt the two ſhaddowes, will bee the true Meridian circle for that place.*

This Theoreme, howſoeuer conſiſting of many parts, is notwithſtanding eaſie enough to bee vnderſtood, being explayned by an ocular demonſtration. Let there bee gotten a platforme of wood or metall, and placed euenly that it may lye parallell

with



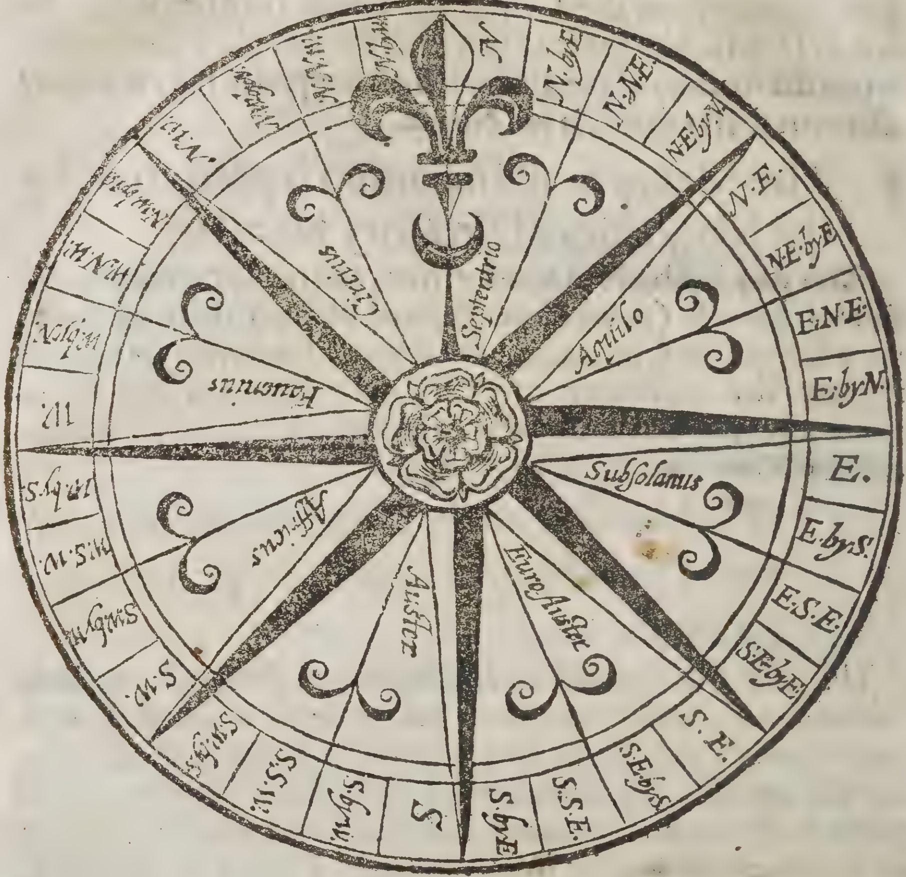
with the plaine of the Horizon: In this plaine let there bee deſcribed diuerſe circles from the ſame Center E. In this Center let there bee rayſed a Gnomon E F to right angles, ſo that the top of this Gnomon F, ſhall euery where bee equally diſtant from the circumference of each circle deſcribed in the plaine, which may eaſily bee knowne, becauſe if it bee equally diſtant from any three points of any circles Circumference, it will alſo bee equally diſtant from all the reſt alike, as *Clauius* hath taught in the 4 of his *Gnomonicks*. This platforme being thus ordered let the ſhaddow of the Gnomon bee obſerued ſometimes before Noone, vntill ſuch time as it exactly ſhall touch the circumference of one of thoſe circles, as in E G. Againe in the Afternoone, let the ſhaddow bee obſerued, till with his end it meet the circumference of the ſame circle, as in E H, which will happen ſo many houres afternoone, as the other before Noone. Theſe two points G and H, being diligently obſerued, let the Arch of the Circle G H bee diuided into two halfes with a line drawne from the Center E, which ſhall bee E D. This line E D will bee the true Meridian for that place, on which when the ſhadow of the gnomon ſhall happen to fall, wee may aſſure our ſelues that it is full Noone.

7 The Magneticall Inuention is performed by the Magneticall Directory Needle.

This way is ſubiect to much errour, and not ſo certaine as the former, becauſe (as wee haue ſhewed before) there are found very few places which admit not ſome of *Variation*: yet becauſe it may bee profitable to ſuch, who haue not the Command alwayes of the *Sunne*, or ſight of the *Starres*, I will inſert this *Theoreme*.

1 *The Line wherein the* Directory *needle is directed from North to South, is the* Meridian *for the place.*

This may bee ſhewed in any Marriners *Compaſſe*, or little *Sunne-Dyall*, whoſe needle is magnetically touched. For being ſet euenly parallell to the playne of the Horizon, it will ſhew by the needle, the Miridian for that place in euery verticall point on the earth. For example in the *Sea-Compaſſe* in the next page, experience will witneſſe in euery Region of the Earth, that the one point ſigned out by the *Lilly*, will alwayes turne to the *North*; the other oppoſite part, will turne it ſelfe to the South; which two parts being ioyned together by a right Line will ſhew the Meridian for that place: The Meridian (I ſay) not alwayes the true; for this Inuention taken from the *Magnet* is not ſo exact as the Aſtronomicall: for as much as few or no places are found, wherein the *Magneticall* Needle admits not a *Variation* from the true points of *North* and *South*: Neuertheleſſe, this way is very neceſſary to bee knowne: for as much as the Sunne and Starres are not alwayes to bee ſeene; at leaſt in ſuch place and manner as may fauour exactneſſe of obſeruation: Hence may bee demonſtrated in particulars, what wee obſerued before in generall in our *Magneticall*



Treatiſe that the *Circles* of the Globe are not meere *Imaginary Fictions*, or bare Reſpects, growing out of the Application of *Celeſtiall* bodies (as ſome haue thought them) but grounded on the *Magneticall* Diſpoſition of the *Terreſtriall Globe*.

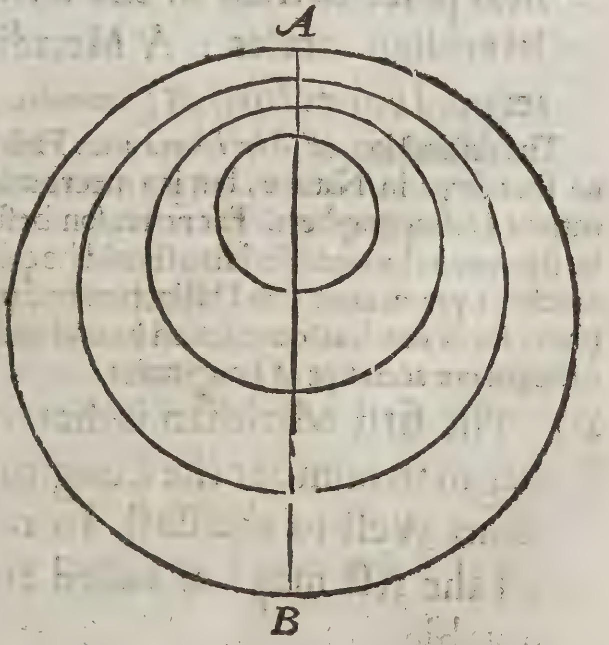
8 Beſide the *Aſtronomicall* and *Magneticall* Inuention of the Meridian, there is another way more popular, but leſſe exact, which is without any obſeruation of the Heauens, or the Magnets operation.

Of the Inuention of the Meridian circle, the true and exact knowledge,

knowledge (as wee haue ſhewed) is endebted to heauenly obſeruation, or Magneticall experiment. Neuertheleſſe Nature is not ſo barren, but ſhe hath pointed out to an induſtrious obſeruation, ſome markes and foote-ſteps in other inferiour bodies, for the finding out of this profitable circle. Which wayes, howſoeuer of leſſe *Account* then the other, and therefore of leſſe vſe, are notwithſtanding pleaſant to vnderſtand : becauſe nothing delights more an ingenious minde, then the contemplation of Gods working, in and by his creatures, which men vſually terme *Nature*. To make a particular ſearch into all Planets, Stones, Mettals, and other ſuch Bodies, were to goe too far out of my way, without a Guide. I will giue one only Inſtance of Trees, whereof I will inſert this Probleme.

1 *By the Inciſion of a Tree, to find out the* Meridian.

To performe this Probleme, let there bee choſen out ſome Tree in an open free field, farre from walles or other obſtacles; in ſuch a place as it hath beene on either ſide freely enlightned and heated by the Sunne-beames : let the Trunke of this Tree bee very right and ſound : let this Trunke bee cut off by the middeſt, in ſuch ſort that the ſection be Parallell to the Horizon, and the vnder-part of the Trunke bee left to ſtand in his former Naturall ſituation : Now the Section on the top of it being well plained,



will as in a plaine diſcouer diuers circles, which are *Excentricke* and not drawne from the ſame Center, but on the one ſide neerer together; on the other further off: That part then which ſhewes the circles thicker and neerer together, points out the North: The other wherein the circles are wider and further off, the one from the other, deſignes out the South-point: betwixt both which if a right line bee drawne, it will bee the *Meridian* for that place. Which experiment *Blancanus* (as hee writes) tryed in a *Plume-Tree*, but giues no reaſon for it. The cauſe I take to be no other then the extenſion and diffuſion of the ſappe or moiſture, by the heate of the Sunne: which is more on the *South-ſide* then the *North-ſide*: for as much as the *Sunne* in our clime reſpects vs on the South, neuer on the North. Hence is it, that the circles which are nothing elſe but the excreſcences of the moiſture, being more rarified on the *South-ſide*, and therefore requiring a greater place, are found to bee greater.

9 Hauing ſhewed the *Inuention*, wee are in the next place to treat of the *Diſtinction* of theſe Meridian circles: A Meridian therefore is termed either *Firſt* or *Common.*

The diſtinction of *Meridians* into Firſt and Common, hath no foot-ſteps in Nature, but is a meere arbitrary Impoſition of antient Coſmographers. For no reaſon beſides *Conueniency* can be ſhewne, why one Meridian ſhould be called *Firſt* rather then another: yet cannot this Diſtinction bee wanting to a Geographer, for as much as ſome ſetled bound muſt be ſet, from which to begin our accompt of Longitudes.

10 The firſt Meridian is that from which wee begin to number the Longitude of the Earth, from Weſt to the Eaſt. In reſpect of which all the reſt may bee called common or leſſe notable.

The ancient Coſmographers, amongſt whom *Ptolomy* was the chiefe, haue ſet the firſt Meridian in the *Fortunate* Ilands, from whence they began their accompt, paſſing Eaſtward through *Europe* and *Africa*, and ſo through *Aſia*, to the vttermoſt parts of *India*, vntill they returned againe to the firſt Meridian, paſſing through the *Fortunate* Ilands; Some haue doubted whether theſe Ilands called by *Ptolomy* the *Fortunate* Ilands, be the ſame with the *Canaries*; becauſe (as our Countreyman Mr *Hues* hath obſerued) the Latitude giuen by *Ptolomy* to the *Fortunate* Ilands, agrees not exactly to the *Canaries*; but rather to the Ilands of *Cape-Verde*. Notwithſtanding this obſeruation, I rather ſticke to the common opinion, thinking it no vnlike matter, that *Ptolomy* dwelling far Eaſtward, and truſting to other mens obſeruations, ſhould erre in this, as well as other matters. The reaſon why the firſt Meridian ſhould bee placed here, rather then elſewhere, is thought by ſome to bee; becauſe the Ancients ſuppoſed two *Magneticall* Poles in the Earth, which ſhould bee the cauſe of the *Variation* of the Compaſſe. Now becauſe in the *Canary* Ilands, was found no Variation at all, they thought it to bee the place where the *Magneticall* and the *true* Meridian ſhould concurre, as wherein were both the Poles, of the *World*, and of the *Load-ſtone*: which made them to make it the firſt Meridian: But this reaſon I take to bee vnlikely; becauſe as I finde it obſerued by latter Writers, in the *Canary* Ilands themſelues there is found a *Variation* of the Compaſſe, although very little: the reaſon whereof wee haue ſhewed to bee becauſe it is the middeſt betwixt two great Continents, to wit, the one of *Europe* and *Africa*, the other of *America*. Whoſe magneticall temper being almoſt equall, will not ſuffer the magneticall *Needle* to moue more one way then another: Moreouer, I am certainely perſwaded (as far as I can gather) that this placing of the *Firſt Meridian* was appointed here before any certainty was knowne of the *Variation* of the Compaſſe. The more probable coniecture therefore is that *Ptolomy* here placed the *Firſt Meridian*, becauſe it was the vttermoſt verge of land toward the Weſt, then diſcouered, neuer dreaming of a Weſterne world afterward

detected

detected and brought to light by *Chriſtopher Calumbus* and *Americus Veſputius*. Some of the latter *Geographers* ſtriuing to bee more exact, haue placed the *Firſt Meridian* in their Mappes out of the *Canaries* in the Ilands of the *Azores* called S. *Michaels* Iland. So that the firſt Meridian of *Ptolomy* differs from the place of theſe latter *Coſmographers* about 9 degrees: which is diligently to bee noted of ſuch as beginne the Science; becauſe this variety not perceiued, will breed great errour and confuſion: yet is not the firſt of *Ptolomy* out of vſe, but retained of many good *Geographers*. Euery other *Meridian* in reſpect of this, may be called *Common*, or leſſe notable, becauſe this is moſt remarkable: yet may the reſt compared amongſt themſelues be ranged in a certaine order, as the *Second*, *Third*, *Fourth*, *Fifth*, and ſo along till we come againe to the *Firſt*, being in all reduced to the number of 180, anſwering to 360 Degrees as wee haue taught. So much for the Meridians.

11 The *Parallels* are equidiſtant Circles paſſing from the Eaſt to the Weſt directly.

I haue defined the *Parallell* Circles in a larger ſenſe then former *Geographers* vſually haue taken it in: as willing vnder this generall name, not onely to include the Parallels commonly ſo called, but alſo the *Equatour*: becauſe I ſee no reaſon why the *Equatour* being euery where equidiſtant from each other Circle, ſhould not ſuffer this acception. The common ſort of Coſmographers, vnder this name, would onely comprize the minor Circles, which are conceiued to bee equally diſtant and correſpondent to the *Equinoctiall* Circle, ſo that all ſhould bee ſo called in reſpect of the *Equatour*, to whom they are ſaid to anſwer, not in *ſite* and *poſition*; for as much as they decline from the middle of the Earth to the North and South: but in *Compariſon* and *Proportion*; for as the *Equatour* is drawne from Eaſt to Weſt, and diuides the whole Spheare of the Earth into the North and South Hemiſpheares: So the other alſo diuide the Globe of the Earth, though not into two *equall* parts as the *Equatour*, but vnequall. Theſe

Parallels many wayes are diſtinguſhed from the *Meridians*: firſt, becauſe the Meridians are drawne directly from North to South: but the Parallels from Eaſt to Weſt. Secondly, the Meridians, how many ſoeuer they are imagined to bee, concurre and meete all in the Poles of the Earth: whereas the Parallels howſoeuer drawne out at length, will neuer concurre or meete in any point. Whence it muſt needes follow that all Parallels and Meridians in the Globe muſt cut one the other, and make right angles. These Parallels although infinite in number, may bee in the Spheare reduced to the number of the Meridians, becauſe they are drawne through the oppoſite points and degrees of the Meridian Semi-circle, which would make vp the number of 180: but yet for *Conueniency* they haue not painted ſo many in the face of the *Artificiall* Spheare; for as much as ſo many lines and circles might beget Confuſion. Wherefore *Ptolomy* and the Ancients haue diſtinguiſhed the Parallels on both ſides the *Equator*, North and South, with ſuch a Diſtance, that where the day ſhould increaſe one quarter of an houre, a new Parallell ſhould be placed. So that the longeſt day of one Parallell ſhould ſurpaſſe the longeſt day of another, for one quarter of an houre. By which appeares that the Parallels are not of one greatneſſe, but by how much neerer the Pole they are placed; ſo much leſſe are they; and ſo much greater by how much farther off from the *Poles*, and neereſt the *Equatour*. These Circles are of great vſe in Geographie, as to diſtinguiſh the *Zone*: *Climats*, and *Latitudes* of *Regions*, to ſhew the *Eleuation* of the Pole, and to deſigne out the *length* and *ſhortneſſe* of the day in any part of the Earth.

12 A Parallell Circle is of two ſorts; either greater or leſſer: The greater is the Equatour or equinoctiall Circle.

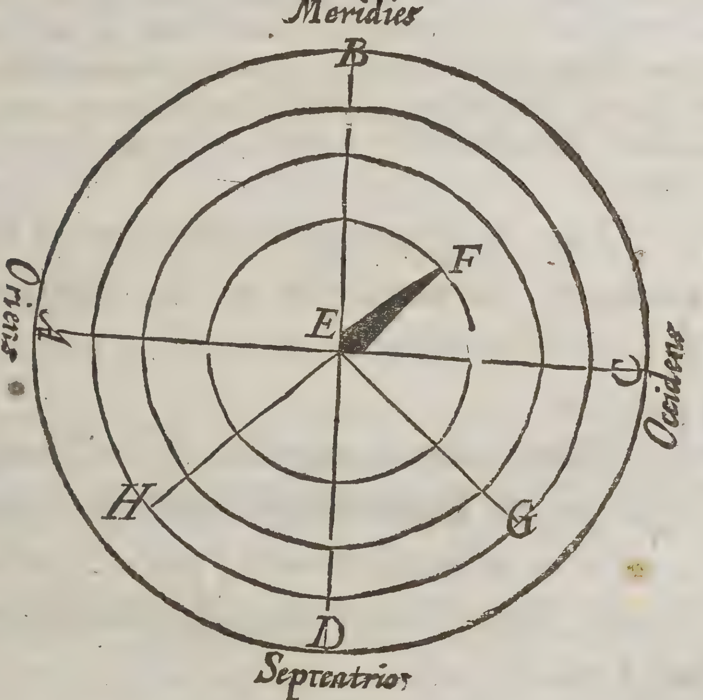
13 The *Equatour* is the greateſt of the Parallels, paſſing through the middeſt of the

Earth, and exactly diuiding them from the Poles into two equall halfes or Hemiſpheares whereof the one is North, the other South.

This Circle is called the *Equatour* or *Equinoctiall* of Aſtronomers; becauſe, that when the Sunne paſſeth vnder it, as vpon the 11 of *March*, and the 13 of *September*, it makes the Day and Night equall. This Circle of Aſtronomers is eſteemed the moſt notable, being the meaſure of the *Diurnall* and moſt regular Motions. The *Latines* haue taken the name and appellation of this Circle from the Day, as the *Greeks* from the Night: Wherein the Senſe is no way varyed; becauſe the equality of the Day argues the like equality of the Night. The two Poles of the Circle, are the ſame with the Poles of the Vniuerſall Earth: to wit, the Articke or North-Pole, and the Antarticke and Southerne Pole: whereof the former is alwayes conſpicuous in our Horizon, the other lies couched and hidde from our Sight. It is called the *Articke-pole* from the Conſtellation of the little *Beare* in the Heauens, neere to the which it is ſituated: in oppoſition to the which the other is called *Antarticke*. It hath manifold vſe in Aſtronomy, copiouſly by *Aſtronomers*: And no leſſe in *Geography*: for without this *Equinoctiall* Circle, no Deſcription of the Earth can be abſolute & perfect, neither any Citie or Place. in the Terreſtriall Globe or Mappe ſet in his due and proper place. This Equinoctiall Circle in regard of the Earth, paſſeth through the middle-moſt part almoſt of *Africa*, by *Ethiopia*, *America*, and *Taprobana*: So that it exactly diuideth the Globe of the Earth into two halfes, the *Northerne* and *Southerne* Hemiſpheares; ſo that theſe people which dwell vnder the *Equatour* are ſaid to inhabite the middle of the world, because they incline neither to the North, nor to the South: hauing ſo much diſtance from the *Articke Antarticke-Pole* of the Earth. Moreouer, by this Circle (as wee will declare hereafter) are noted out vnto vs the Eaſt and Weſt-part of the Spheare, no way to be neglected of Geographers.

1 Concerning the Equatour, two things are to be obſerued: either the *Jnuention*, or the *Site* and Poſition: The Inuention is either *Aſtronomicall* or *Magneticall*. The Aſtronomicall according to theſe Rules.

1 *The Meridian being found out, to find the Equator.*



This is eaſily performed by the helpe of the former Figure: for therein the Meridian line being found out (as we haue ſhewed) let there bee drawne by the Center E of that Circle, the line A C, making right Angles with the ſaid *Meridian*: which line A C will bee the true Equatour, and will point out vnto vs the true *Eaſt* and *Weſt*: as A the Eaſt and C the Weſt. Whence it appeares that the two lines, to wit, of the *Equa-*

tour and the Meridian doe diuide and cut the whole Horizon into two equall Quadrants.

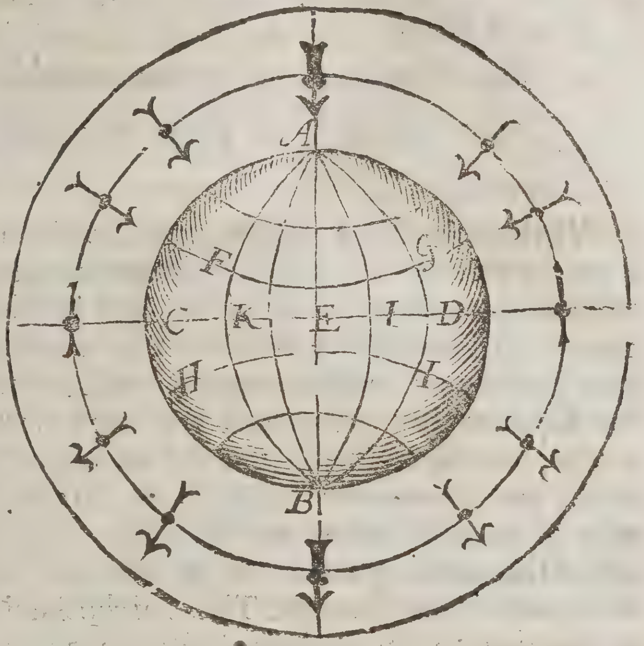
2 *Without the helpe of the Meridian to find out the Equatour.*

In the time of either Equinoctiall in ſome Horizontall plaine, in the Sunne-ſhine, let there bee erected a Gnomon: then in the day time, let there bee noted all the points by which the end or top of the ſhadow hath paſſed: for all thoſe points in the time of *Equinoctiall*, are in a right line; becauſe then the end of the ſhadow is carried in a line in the time of the Equinox in a Herizontall plaine: This line will bee the true *Equinoctiall*-line: the cauſe is giuen by *Clauius* in *Gnomonicis. lib*. 1. *prop*. 1. *Corollar*. 2. which depending on many Geometricall and Aſtronomicall principles, as too far from my purpoſe, I omit.

15 The Magneticall inuention of the Equatour, is wrought by the Magneticall Inclinatory Needle, according to this Propoſition.

1 *Whereſoeuer at any place of the Terreſtriall Spheare, the* Inclinatory *Needle ſhall conforme it ſelfe in a* Parallell-*wiſe*, *to the Axell of the Earth, through that place paſſeth the Equinoctiall Line.*

As to finde out the *Meridian* of any place, wee are to vſe the helpe of the *Directory* Needle: ſo to the finding out of the Equatour, and Parallels, the Inclinatory Needle is moſt neceſſary: becauſe the former reſpects the Magneticall Motion of *Direction*, the latter of *Declination*: Now whereſoeuer wee ſhall ſee the Needle to conforme it ſelfe in ſuch ſort as it may lie Parallell with the *Axell* of the Earth, we may aſſure our ſelues that ſuch a place is vnder the Equinoctiall Circle : The reaſon whereof, wee haue giuen in our 3 Chapter out of the *Cōuertible* nature of the Magnet, and here needs no repetition: only wee will inſert this one figure wherein the line C D drawne through the Centers of two Inclinatory Needles, lying Parallell to the Axell of the Earth, A. B. will expreſſe this Equinoctiall line which wee here ſeeke. For the Magneticall *Jnclinatory* Needle being ſet in a Frame or Ring made for ſuch a purpoſe, will vnder the Equator reſpect one Pole no more then another : but lie leuell with the Plaine of the Horizon : as vnder the Poles it will make right Angles with the Plaine of the Horizon. In the middle ſpaces betwixt the Equatour and the Poles, it will conforme it ſelfe in ſuch ſort, as it makes certaine Angles with the Axell of the Earth, though not equall, yet proportionall to the Latitude; out of which an ingenious Artificer may deduce the Parallels of any place, without any obſeruations of the Heauens : as is taught by Inſtruments inuented by *Gilbert*, *Ridley*, and diuers others which haue vndertaken this ſubiect.



16 Of the *Jnuention* of the Equatour wee haue ſpoken : In the *ſite* we ought to con-

ſider the placing of the Equator in reſpect of the world.

1 *The Equatour is an vnmoueable Circle, whoſe Poles neuer vary from the fixt Poles of the world.*

Whether the Poles of the Equator haue been any times varied from the Poles of the world, is a controuerſie which hath exerciſed the greateſt wits: *Ioſeph Scaliger* truſting (as it ſeemes) more to ancient Hiſtory then Moderne experiment, ſeemes in two Epiſtles not only to make a doubt, whether the Poles of the Equatour haue continued the ſame with the Poles of the world; but ſuperciliouſly (as the manner of moſt criticks is) rather out of *coniecture* then *Reaſon*, to taxe the common opinion of manifeſt errour and abſurdity. The ground and originall of this doubt growes out of the obſeruation of the fixt Stars, which haue ſince the Times of the Ancients, beene found to bee moued out of their places, or at leaſt not to retaine the ſame points in the Period of the *Sunnes* Motion. The chiefeſt Inſtances are taken from the ſtars in the Hornes of *Aries*, which in *Hyparchus* time, which liued aboue 60 yeeres before *Ptolomy*, were obſerued to bee not much diſtant from the *Equinoxe*, and before him in the very point it ſelfe; but in our time remoued about 28 Degrees off: Alſo it is obſerued in the Cynoſure or Pole-ſtar, that in *Hyparchus* time it was diſtant from the Pole about 12 Degrees, which wee finde in our time to bee ſcarce 3 Degrees diſtant. To ſalue this Apparence, *Ptolomy* inuented a ſlow motion of the *Starry* Heauen or *Firmament*, whereby the Fixt ſtars might bee remoued farther off from the Equinoctiall points in the Eclipticke, whence of a conſequence the *Pole-ſtarre* ſhould not keep the ſame poſition in reſpect of the *Pole* it ſelfe, but vary his ſite according to the Motion: which opinion hath a long time paſſed without contradiction; till *Copernicus* out of new grounds ſought for this Motion in the Earth, to which hee aſſigned no leſſe then three Motions. Since *Copernicus*, aroſe *Ioſeph Scaliger*, who contradicting the common receiued grounds,and yet for ought I ſee, not truſting to the ſuppoſitions of *Copernicus*, would bring in another opinion: to wit, that the Stars of the Firmament are not moued from the point of the *Equinoxe*, but rather that the *point* is carryed away from the *ſtars*. The deciſion of this point I dare not vndertake,better becomming the learned and induſtrious endeauours of our worthy Profeſſours, M. Doctour *Bainbrigge*,and M. *Henry Brigges*,as beſt ſuiting with their Learning and Profeſſion: *Ipſe ſemipaganus, ad ſacra vatum carmen offero noſtrum*. Neuertheleſſe as a Learner,for mine owne ſatisfaction, I would willingly enter a little into conference with this great and admired Oracle *Ioſeph Scaliger*,to ſound the certainty of his grounds. That the *Pole-ſtarre* (ſaith hee) was ſo far diſtant from the *Pole* as 12 Degrees,was no true obſeruation,but the errour of *Hyparchus*, who afterwards by his authority deceiued *Ptolomy*; and He, Poſterity. The Reaſons hee alleadged are, 1 Becauſe *Eudoxus* which was more ancient then *Hyparchus*, obſerued the ſame ſtar to bee in no other place, then where now it is. 2 Becauſe that greater light of Aſtronomy,*Copernicus* perceiuing the *Equinoxes* and *Solſtitiall* points to be moued,was enforced to inuent other grounds; but becauſe his demonſtrations depended only on the *Apparences*, hee ſought out this effect in the motion of the Earth. If it were manners to oppoſe ſo great a Scholler as *Joſeph Scaliger*, I would aske a few queſtions, why we ſhould not credite the obſeruations of *Hyparchus*, *Ptolomy*, and all *poſterity*, as well as of *Eudoxus*: ſith Antiquity without conſent & approbation,is no great argument of truth. Neuertheleſſe if the matter be well examined, we ſhall perhaps find Antiquity to be more firme on our ſide. The ſame reaſon (as I take it) may be giuen for the ſtars in the Hornes of *Aries*, as of the *Pole-ſtarre*,becauſe all the *fixt-ſtarres*,by the conſent of all,are imagined to keep the ſame vniforme ſite among themſelues in ſuch ſort,as the varying of ſome would diſorder all the reſt: at leaſt argue the like variety or change of all. Now to proue the ſtars of *Aries* to haue beene varyed,many of the Ancients (as Maſter *Hues* hath obſerued) liuing in diuers times, haue confirmed. The firſt ſtar of *Aries*, which in the time of *Meto Atticus*, was obſerued in the *Vernall Interſection*, in the time of *Thales Mileſius* was before it 2 Degrees; in *Tymocharis* age it was after it 2 Degrees 24 Minutes: In *Hipparchus* time 4 Degrees, 40 Minutes; in *Abbumazars* 17 Degrees, 50 Minutes; in *Albarens* 18 Degrees, 10 Minutes; in *Arzachels* 19 Deg. 37 Min. in *Alphonſus* his time 23 Deg. 48 Min In the time of *Copernicus*, and *Rheticus*, 27 Degrees, 21. Min. In our time about 28. Againſt all theſe Teſtimonies, if we ſhould oppoſe the Teſtimony of *Eudoxus* and *Scaliger*, wee ſhould bee thought very partiall to preferre them before the conſent of Antiquity: *Eudoxus* though very *Antient*, being but one, and the other one of the laſt. If any ſhould obiect, that *Eudoxus* ſpake onely of the *Pole-ſtarre*, and not of the ſtars, in the hornes of *Aries*; I anſwere, as before, that the ſame reaſon is to bee giuen of them both; For as much, as if the *Pole-ſtarre* in *Eudoxus* time moued in a Parallell, Equidiſtant from the *Pole* of the Equatour (which he ſeemes to contend) then muſt alſo the ſtars of *Aries*, which were found once to bee in the point of the vernall Equinoxe, moue alwayes in the Equinoctiall circle, and neuer vary from it; which is contrary to all the Teſtimonies before alleadged. Secondly, where he ſaith, that *Copernicus* perceiuing this error, left a baſe diſcouery, without any *Demonſtration*, except onely Εκ τῶν φαινομένων, I would know how *Joſeph Scaliger* by any other meanes came to know it? I alwayes ſuppoſed it a principle amongſt *Mathematicians*, that the τὰ φαινόμενα had beene the ſureſt ground of Mathematicall Demonſtration: for euery reaſon which can be alleadged, muſt of neceſſity bee grounded on meere coniecture, as forged in a mans braine without any obſeruation of Nature; or elſe ſuggeſted vnto vs from the things themſelues. How little dependency is on the *Former*, let euery man iudge: where it is as eaſie for euery man to deny, as affirme; and ſuch fancies are better reſerued in the braine, wherein they were firſt hatched, then bee ſuffered to proceed further. If wee deriue our Argument (as we ought to doe) from the footſteppes of Nature; wee muſt draw it either from the *Forme* it ſelfe, or from ſome *effect* or propriety ariſing from it: The former is vnpoſſible I may well ſay in any thing,

thing; becauſe the firſt *forme* and nature, no wayes diſcouers it ſelfe to our vnderſtanding, but by the apparent Accidents: much leſſe can this bee hoped for in the Heauens, being as far diſtant from vs in ſpace, as Nature. If then we are left only to the later, what other ground can we haue of our Argumentation, then the τὰ φαινόμενα or Apparences: which kind of way, *Scaliger* in *Copernicus* ſtriues to ſleight or reiect as weake or deficient: taking then this to bee the onely way to ſearch as neere as wee can into the truth of their matters, wee will in the third place ſhew how far it may oppoſe *Scaliger*, and fauour our Aſſertion. That the firſt Star of *Aries* is more diſtant from the Equinoctiall point, is a matter which ſeemes to bee agreed on by all ſides. This Apparence muſt neceſſarily ariſe out of ſome Motion. This Motion muſt bee ſought either in the *Earth* (as *Copernicus* would haue:) or in the *Heauens*. That it cannot with any great probability bee in the Earth, wee haue ſhewed in the third Chapter, where wee haue proued it to haue a Magneticall verticity, whereby it continually reſpects the ſame *Poles*. The Arguments (I confeſſe) are only probable: but this is an opinion which *Scaliger* defendeth not. If wee ſeeke this effect in the Heauens, it muſt of neceſſity (which *Scaliger* confeſſeth) happen one of theſe 2 wayes: For either the ſtars ſtanding vnmoueable, the Equinoctiall & Solſtitiall points muſt bee moued, or els the ſtars themſelues ſhould moue, as *Ptolomy* defends. Here I cannot but remember a merry anſwer of that great *Atlas* of Arts, Sir *Henry Sauile* in the like queſtion. Being once inuited vnto his Table, and hauing entred into ſome familiar diſcourſes concerning *Aſtronomicall* ſuppoſitions: I asked him what he thought of the *Hypotheſis* of *Copernicus*, who held the *Sunne* to ſtand *fixt*, and the *Earth* to bee ſubiect to a *Triple* Motion: His anſwer was; hee cared not which were true, ſo the Apparences were ſolued, and the accompt exact: ſith each way either the old of *Ptolomy*, or the new of *Copernicus*, would indifferently ſerue an Aſtronomer. Is it not all one (ſaith he) ſitting at Dinner, whether my Table be brought to mee, or I goe to my Table, ſo I eat my meat? Such an anſwer would aſwell befit this queſtion: whether the firſt ſtar of *Aries* ſhould bee moued from the *E*-

quinoctiall point, or the *point* from it, 'tis a matter ſhould little trouble a *Coſmographer*; ſo either way might indifferently ſerue to ſalue the apparent obſeruations: But how *Scaliger* vpon this granted ſuppoſition, would make all whole, without diſturbing the order and forme of Nature in the celeſtiall Machine? what Regular motion he would giue the Sunne, whoſe period deſcribes the *Equinoctiall points*, which he makes moueable? what other *Poles* he would aſſigne to the world beſides that of the Equator? is a matter of a more curious ſearch, and beſides the limits of my ſubiect: The full diſcuſſion of which points, as moſt of the reſt: *Illis relinquo quorum imagines lambunt----Hederæ ſequaces.*

17 The *leſſer* Parallels are equidiſtant lines anſwering to the Equator, which diuide the Globe of the Earth into two vnequall parts.

18 Theſe *leſſer* Parallels are againe of two ſorts: either *Named* or *Nameleſſe*; Named are ſuch as are called by ſpeciall names, and haue more ſpeciall vſe in Geographie; ſuch as are the two *Tropicks*, and the two *Polar* circles.

19 The *Tropicks* are Parallels bounding the Suns greateſt declination, which is either to the North, and is called the Tropicke of *Cancer*: or towards the South, and is called the Tropicke of *Capricorne.*

The Tropickes haue taken their names from the conuerſion or turning backe of the Sunne; becauſe the Sunne declining from the *Equinoctiall* circle either North or South, proceedeth in his courſe no further then this circle, and ſo turneth backe: ſo that in the heauens they are as limits and bounds, comprehending within them that ſpace, without the which the Sunne neuer moues: Conſonant to theſe *Celeſtiall Tropicks*, are there imagined in the earth the like, immediately placed vnder them: which are apparent, not onely by *Application* of the Celeſtiall Globe, and his parts to the Terreſtriall; but alſo out of the *Magneticall* diſpoſition of the earth, as wee haue already ſhewed: The Tropicke bounding the Suns greateſt declination towards the North, is called the Tropicke of *Cancer*; becauſe the Sunne arriuing at that Tropicke, is lodged in the ſigne of *Cancer*: The other is termed the Tropicke of *Capricorne*; becauſe the Sunne touching that Tropicke, is in that ſigne: The diſtance of theſe Tropickes, from the Equatour, is ordinarily put 23 Degrees, and 30 Minutes; which is alſo the diſtance of the Poles of the *Eclipticke*, from the Poles of the world. The Tropick of *Cancer*, as it is conceiued in the Earth; paſſeth by the greater *Aſia*, by the *Red-Sea*, or *Sinus Arabicus*, and *China*, and *India*: But the Tropicke of *Capricorne*, ſituate on the Southerne ſide, runneth along by the moſt Southerne coaſt of *Africke*, and that part of *America* which is called *Braſilia*; Beſides many Ilands in the *Indian* Sea.

2 The *Polar* circles are Parallels anſwering to the Polar circles of the Heauens, drawne by the Poles of the Eclipticke: Theſe are of two ſorts: either the *Articke* compaſſing round the North-Pole; or the *Antarticke* compaſſing round the Antarticke or South Pole.

The Polar Circles, as they are conceiued in the heauens by Aſtronomers, are deſcribed by the Poles of the Eclipticke, carried by the diurnall motion about the Poles of the world. Correſpondent to theſe circles in the heauens are imagined two circles on the earth, which wee alſo call Polar; and if wee beleeue *Gilbert*, with other Magneticall Philoſophers, they are primarily in the Earth, as that which is the true ſubiect of diurnall motion. Theſe circles thus deſcribed by the Pole of the Eclipticke, muſt needs challenge the ſame diſtance from the Pole, which the Pole of the Eclipticke hath, to wit, 23. Degrees, and 30 Minutes. The *Greeks* haue taken the Polar circles, in another ſenſe then the *Latines*: for by theſe Polar circles (as it appeares by *Proclus*, and *Cleomedes*) they vnderſtand not ſuch circles as are deſcribed by the Pole of the *Zodiacke*: but two other circles; whereof the one is greateſt of all the Parallels, which alwayes appeares aboue our Horizon; the other is the greateſt of all thoſe Parallels which lie hid in our Horizon perpetually: The reaſon why the *Græcians* tooke it in this ſenſe, was; becauſe by theſe circles they could know and diſtinguiſh thoſe ſtars; which alwayes are ſeene and neuer ſet, as thoſe which are comprehended of the *Articke* circle; from thoſe which alwayes lie hidde and neuer riſe; as ſuch as the *Antarticke* containes: Whence it manifeſtly appeares, that the two Polar circles, as they are taken of the *Græcians* in all Regions, are not of the ſame quantity & greatneſſe, but are greater in oblique Spheare then in a right: but our Polar circles are at all places alike in their quantity. Of theſe, the one tearmed *Articke* in the Earth paſſeth by *Iſlandia*, the top of *Norway* and *Finland*, with many adioyning Ilands, and the Southerne part of *Green-land*, as may appeare by our ordinary Geographicall Mappes. The other Polar circle called *Antarticke*, paſſeth through the South part of the world (as yet) vndiſcouered, except for ſome few parcels, as *Terra del Feugo*, and *Pſitacorum Regio*, with ſomewhat more, lately diſcouered by the *Spaniards*. The chiefeſt vſe as well of theſe, as other parallels, is to diſtinguiſh the *Zones* and *Climates* in the Globe, whereof wee ſhall haue occaſion to treate hereafter.

21 The *Nameleſſe* Parallels are ſuch as are not knowne by ſpeciall Names, nor of ſo great vſe in Geographie.

Theſe nameleſſe parallels may bee well vnderſtood by that which we haue aboue ſpoken: for howſoeuer they bee not called by particular and ſpeciall names, yet are they all of the ſame nature: All theſe parallels beſide the Equatour, though infinite in number, may notwithſtãding in the ſpheare be reduced to the number of the Meridians; becauſe they are drawne through the oppoſite points of the Meridian ſemicircle; ſo that wee might account 180: but yet there are not ſo many painted on the face of the *Artificiall* Globe; wherefore *Ptolomy* with the ancients, haue diſtinguiſhed the parallels on both ſides, North and South, beginning from the Equatour at ſuch a diſtance, that where the day ſhould increaſe one quarter of an houre, a new parallell ſhould be placed: ſo that the longeſt day of one parallell, ſhould exceed the longeſt day of another parallell by one quarter of an houre. Euery one of theſe parallels, is ſuppoſed to be diuided into 360 Degrees, as all the reſt of the other circles; yet are we to note that the degrees and parts of a greater circle are greater; of the leſſer, leſſe, according to the proportion of the ſaid circle; the ſame haue the proportion that a great circle hath to a leſſe, ſo that the ſame degrees and parts of a quarter circle, to the degrees and parts of the leſſer; as may be gathered from the firſt propoſition of the ſecond booke of *Theodoſius*: now to know rightly this proportion, we muſt firſt finde out the ſummary declination for euery region, which being once found, we may proceed in this manner, by the doctrine of Triangles.

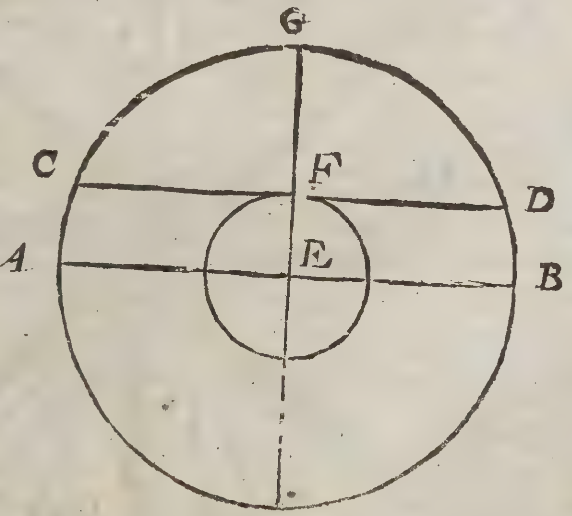
1 *Let the ſigne of the Complement of the Declination of the leſſer Circle bee multiplied by the whole Circle, and the product bee diuided by the totall ſigne, there will ariſe the number of Degrees of the leſſer Circle, ſuch as whereof the greater conſiſts.*

The reaſon hereof is ſhewed in Geometry, and therefore need we not to inſert a demonſtration; for there we learne, that as the totall finge is to the ſigne of the Cōplement of the Declination of any Parallell, ſo is the Periphery of the greater circle, to the Periphery of the Parallell: As for example, if we would know what proportion the Equatour hath to the Parallell, which paſſeth by the Verticall point of *Rome*; whoſe Declination is about 42 Degrees; I multiply the ſigne of the Complement of this Declination, that is, the ſigne of 48 Degrees, to wit, 74314, by 360; the product whereof is, 26753040; which I diuide agayne by 100000, and find 267 degrees, and $\frac{1}{2}$: whence I gather that the Equatour to the Parallell of *Rome*, or a degree of the Equatour, to a degree of the Parallell of *Rome*, hath the ſame proportion that that 360 hath to 276 $\frac{1}{2}$, which is the ſame that 4 hath to 3.

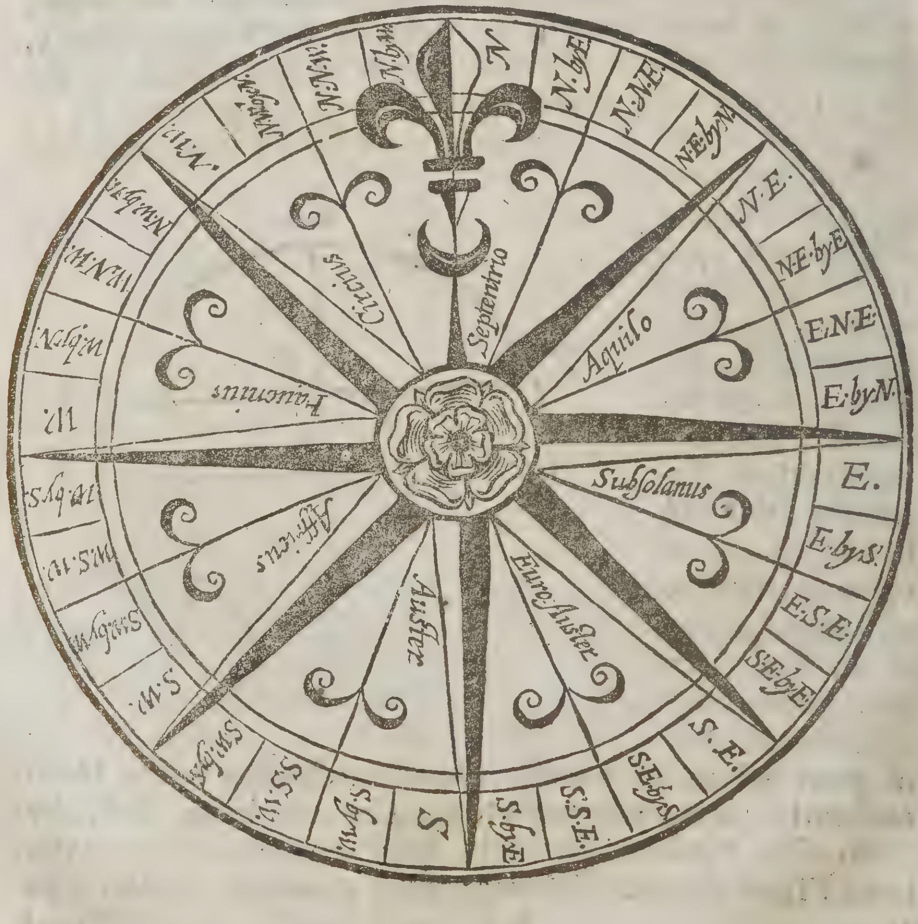
22 Hitherto haue we ſpoken of the *Abſolute* Circles, ſuch as are the Meridians and Parallels: wee are to treate in the laſt place of a *Relatiue* Circle, which is conceiued in reſpect to our ſight: this Circle is called the *Horizon.*

23 The Horizon is a Circle which diuides the vpper and viſible parts of the Terreſtriall Globe, from the lower and inuiſible.

The name of the Horizon is taken from the bounding or termination of the ſight; becauſe it is a Circle comprehending all that ſpace which is viſible of vs, diſtinguiſhing it from the reſt which lurkes inuiſible: as if a man ſhould bee placed in a high and eminent place of the Earth, and ſhould looke round about him euery way to the *East*, *Weſt*, *North*, and *South*; Hee will ſeeme to ſee the heauens on euery ſide to concurre with the earth: ſo that beyond it, can be ſeene nor heauen nor earth: which concurrence of the heauens with the earth, will deſcribe vnto vs the *Horizontall* Circle for that place aſſigned. But here wee are to note, that the Horizon is two fold; either the *Rationall* or *Senſible* Horizon. The Rationall preciſely diuides the Globe into two equall parts: But the ſenſible or apparent Horizon, is no other then that Circle in the earth, which is deſigned out by the ſight, from which the name ſeemes to bee deriued. This ſenſible Horizon differs from the rationall diuers wayes; firſt, becauſe the *rationall* diuides the whole ſpheare into two equall parts; but the *ſenſible* into two vnequall parts. Secondly, becauſe the rationall is alwayes certaine and the ſame, in the ſame place, and of alike greatneſſe; whereas the other is greater or leſſer, for the condition of the place or ſight; for the ſemidiameter of the rationall, is the ſame with the ſemidiameter of the earth; but the ſemidiameter of the other, ſeldome or neuer exceeds 60 miles on the Earth. Thirdly, becauſe the rationall *Horizon* paſſeth by the Center of the Earth; whereas the *ſenſible* toucheth onely the ſurface of it, in that point where the Inhabitant ſtandeth: all which differences may bee ſeene in this Figure; wherein the Line C D repreſents vnto vs the *ſenſible* Horizon: the Line A B the *rationall*: The former is called *Naturall* or *Phyſicall*; becauſe it comes vnder the meaſure and apprehenſion of the ſenſe: the other *Aſtronomicall*, because it is of great vſe in Aſtronomy: in the reſolution of the Horizon into his parts, wee ought to conſider two things: firſt, the *Poles* of the *Horizon*; Secondly, his *Periphery*, or circumference: The Poles are commonly called *Zenith* or *Nadir*: The



Zenith is the *Verticall* point, directly placed ouer our Head: whereunto is oppoſite on the other ſide, the *Nadir* directly vnder our foote, and therefore may bee called the *Pedall* point. The parts or interſections in the circumferences, are deſigned out vnto vs, by certaine lines, diſcouering the coaſts in the Terreſtriall Globe: Theſe lines are called either *windes* or *Rhumbes*: The windes with the *Grecians* were onely 8. But the latter Nauigators haue increaſed them to the number of 32, whereof foure were called *Cardinall*; to wit, ſuch as are directed to the foure coaſtes of *Eaſt*, *Weſt*, *North*, and *South*: The other are *Collaterall*, being placed on each ſide of the Cardinall windes. The *Rhumbes* are Lines paſſing by the Verti-



call point of any place, as you may ſee in the Compaſſe going before: Now becauſe one Rhumbe anſwers to two coaſts or windes; the number of the Rhumbes is but halfe the number of the windes; to wit, 16. Here it is to bee noted, that a *Rhumbe* differs from a *Winde*; whereas a *Rhumber* is one line, pointing out vnto vs, two windes or coaſts: Theſe Rhumbes as they are conceiued in the Globe, were thought by *Nonnus* to bee the portions of greater Circles: But learned Mr *Hues* in his booke, out of vndoubted principles, ſtrongly confutes him. The grounds which hee takes are theſe: Firſt, that all Meridians of all places paſſe the Pole, and cut the Equatour and all his parallels at right Angles. Secondly, If our courſe ſhould bee directly any way elſe, then towards one of the poles, a new *Meridian* muſt ſucceed, and a new *Horizon*. Thirdly, that the Iron Needle being touched with the *Load-ſtone*, ſhewes the common ſection of the *Meridian* and the Horizon, and on one ſide perpetually reſpects the *North*, on the other the South. Fourthly, the ſame *Rhumbe* cuts all the *Meridians* at all places at equall Angles, and euery where reſpects the like coaſts in the world. Fiftly, that a greater circle drawne by the Verticall points (if remoued from the Equatour) cannot cut diuers *Meridians* at equall Angles. Sixtly, a greater circle drawne by the Verticall point of any place, makes greater Angles with all other *Meridians* then with that, from which it was firſt drawne: whence it is neceſſary, that the line which ſhall bee ſuppoſed to make Angles with diuers *Meridians* (as the *Rhumbes*) ſhould bee bowed toward the Meridian. I know not what would bee more ſaid againſt the opinion of *P. Nonnus*, who would haue all the *Rhumbes* to bee portions of greater circles. To illuſtrate further the nature and vſe of the *Horizon* wee will inſert theſe Theoremes.

2 *The* Senſible *and* Rationall *Horizon in the Earth, are much different; in reſpect of the Firmament, all one.*

Ptol.dict.1. cap. 5. *Alph. 6. diff. 6.*

Prop. 11. lib. 1.

**Pag.149.*

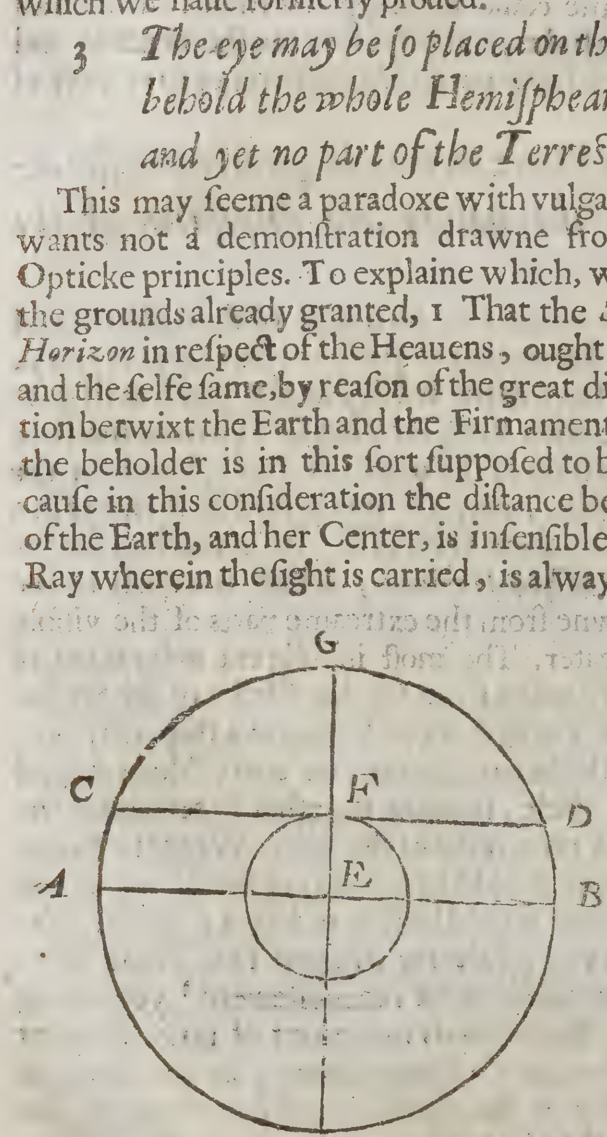
It may bee gathered out of the ſuppoſitions of *Ptolomy* and *Alphraganus*, and almoſt all other Aſtronomers, that no man being placed on the ſurface of the earth can preciſely ſee the halfe of it. For that Horizon which terminates our ſight, as we haue ſhewed, is a plaine ſuperficies euery way circularly extended in the Earth, in ſuch ſort as men placed, either in the Sea in a ſhip, or in a great field or Countrey, would thinke the viſible part of the earth to bee plaine, whoſe ends would ſeeme to touch the Heauens. Whence muſt needs come to paſſe that ſuch an Horizon cannot diuide the Spheare of the earth into two equall parts. For ſo much will be found wanting, as is meaſured betwixt that ſuperficies which toucheth the earth, and that which paſſeth by the Center of it, equidiſtant from the other: for this later only can diuide the earth into 2 equall parts, according to *Theodoſius*, and may well bee ſeene in the * former figure, wherein are expreſſed both *Horizons*, as well the viſible as inuiſible, touching the Spheare in a point on the ſuperficies: as the *Rationall* paſſing by the Center. Neuertheleſſe wee muſt conſider, that the quantity intercepted betwixt theſe two *Horizons* in the Terreſtriall Spheare, is of little or no moment, compared with the whole frame of the Heauens: For ſith the Heauens are ſo farre diſtant from vs, it will come to paſſe that if two equidiſtant lines ſhould bee drawne, the one from the *Eye*, the other from the *Center* of the Earth to the *Firmament*, they would according to ſenſe, appeare one and the ſelfe-ſame; by reaſon of the wonderfull diſtance: as wee ſee in a long Gallery, whoſe walls haue an equall diſtance the one from the other; the walls will notwithſtanding (according to *Opticall* principles) ſeeme wideſt where they are neereſt, and to cloſe and ſhut vp at the ends, or at leaſt to concurre neerer: much more muſt wee imagine this to happen in the ſight, if we compare the greatneſſe of the *Firmament* with the Spheare of the Earth, in whoſe magnitudes wee ſhall finde a incomparable diſparity. This will appeare by the Apparences: for wee ſhall ſee the ſix ſignes of the *Zodiacke*, conſpicuous aboue our *Horizon*, and the other ſix vnder it, hid from our ſight: Alſo the *Sunne* and *Moone*, when they are diametrally oppoſed, almoſt at the ſame moment will appeare, the one in the Eaſt, the other in the Weſt: at leaſt the one will riſe ſoone vpon the ſetting of the other: And (if we beleeue *Pliny*) the Moone was obſerued to bee eclipſed in the Eaſt point; the Sunne at the ſame time being in a ſort aboue the Horizon in the Weſt. Such an Eclipſe could not happen without a diametrall oppoſition of the two lights, and therefore can the Senſible and the Rationall Horizon haue no ſenſible difference in reſpect of the Firmament.

2 *The ſenſible Horizon may be greater or leſſer according to the nature and diſpoſition of the place.*

In this conſideration wee take no notice of the difference of ſights, whether they be weaker or ſharper; but ſuppoſe an eye ſufficient to kenne ſo farre in the Earth, as the place will permit: The difference then betwixt diuerſe Horizons muſt bee ſought out in the condition of the place. A *Sight* placed on the top of a high mountaine, may ſee much farther then one in a low valley, compaſſed about with hills; for as much as the Semidiameter of the ſenſible *Horizon*, which is equall to the Rayes or Lines drawne from the extreame parts of the viſible Earth, are much greater. The moſt indifferent iudgement of this *Horizon*, may bee taken from the ſuperficies of the Sea beyond ſight of land: for a man thereon ſayling in a ſhip, may perceaue the ſurface of the Sea as a plaine, on euery ſide to bound the ſight in a round circle, ſeeming together to terminate the end of the Earth, and protenſion of the ſight. What the Semidiameter of this Horizon ſhould bee, hath not beene yet agreed vpon by all: *Eraſtothenes* would haue it to bee 44 miles. *Macrobius* 23. *Proclus* 250. *Albertus Magnus* 125. Theſe differences ſeeme too great to admit of reconcilement: yet taking into our conſideration the *diſparity* in account of miles betwixt the *Moderne* and *Ancient* Coſmographers; as alſo betwixt the *Greekes* and *Latines*: 2 the diuerſe placing of the *ſight* 3 the various diſpoſition of the *places* wherein they tooke their obſeruations, with other circumſtances, wee ſhould diminiſh much of admiration. But diuerſe others whoſe opinion is more approued by moderne Coſmographers, haue defined it to be about 63 miles. The cauſe why this Horizon ſhould bee ſo little in reſpect of the Rationall which paſſeth by the Center, is the roundneſſe of the earth interpoſed betwixt the ſight and the farther parts, which we haue formerly proued.

3 *The eye may be ſo placed on the Earth, as it may behold the whole Hemiſpheare of the heauens, and yet no part of the Terreſtriall Spheare.*

This may ſeeme a paradoxe with vulgar iudgement; but it wants not a demonſtration drawne from Aſtronomicall and Opticke principles. To explaine which, we muſt ſuppoſe out of the grounds already granted, 1 That the *Senſible* and *Rationall Horizon* in reſpect of the Heauens, ought to bee eſteemed one and the ſelfe ſame, by reaſon of the great diſtance and diſproportion betwixt the Earth and the Firmament. 2 That the eye of the beholder is in this ſort ſuppoſed to bee in the Center; becauſe in this conſideration the diſtance betwixt the ſuperficies of the Earth, and her Center, is inſenſible. 3 That the viſuall Ray wherein the ſight is carried, is alwayes a right line. Now ſuppoſe (according to our former figure) the Center of the eye wherein conſiſts the ſight, to be in the point of the Terreſtriall ſurface F, the diſtance (as wee ſaid) betwixt F and E the Center being inſenſible, the eye is imagined in the center: likewiſe the Horizons C F D, and A E B for the ſame cauſe in



in reſpect of the Heauens are to bee eſteemed one and the ſame; becauſe C A and D B haue no ſenſible difference. It is then manifeſt, that the eye ſo placed will behold in the heauenly Spheare, all which is included betwixt A and B, to wit, the Hemiſpheare A G B, bounded by the Rationall Horizon A E B. Neuertheleſſe in the Terrene Globe it can ſee nothing at all: For either it ſhould ſee onely the point F, wherein it is ſeated, or elſe ſome other point or part diſtant from it: the former cannot bee admitted, becauſe the eye being there ſuppoſed to bee placed, ſhould according to this ſuppoſition behold it ſelfe, which is againſt philoſophy: For granting the ſenſe only a direct and not a reflexe operation, it cannot bee imagined how it ſhould perceiue it ſelfe. Finally, it cannot ſee any point in the Earth beſides; for then this point would either bee placed aboue the point F: but this cannot bee; becauſe F being ſuppoſed in the ſuperficies, admits of no point higher in the Spheare, or elſe vnder it: but this cannot bee, becauſe C F D being a tangent line, and touching the Spheare in F only: there cannot according to Geometricall principles bee drawne any right line from the point F, which can touch any point in the ſaid Spheare, but all will cut it, and ſo the ſection cauſe impediment to the ſight, the Earth being an opacous and round body.

4 *From the Horizontall circle is reckoned the* eleuation *of the Pole in any place aſſigned.*

The finding out of the eleuation of the Pole is a matter moſt neceſſary for a Coſmographer; as ſhall appeare after, where we ſhall ſpeake of the *Latitudes* and *Climates.* It is defined to bee an arch of the *Meridian* betwixt the *Horizon* and the Pole. For the finding out of which many wayes haue beene deuiſed by Artificers: The firſt is taken from the Sunne, the ſecond from the Pole-ſtarre: From the Sun it may bee performed two wayes. 1 At the time of the *Equinoxe.* 2 At any other time of the yeere. At the time of the *Equinoxe* it may be found out by the obſeruation of the Sunnes ſhadow at Noone-tide, in this manner: Let the Meridian height of the Sunne bee ſubtracted:

tracted from the whole quadrant, which is 90 degrees: there will remaine the diſtance of the Zenith to the Equator, which is equall to the eleuation of the Pole. In the ſecond place at any time of the yeere to know the eleuation of the Pole out of the Meridian height of the Sunne, it is neceſſary out of an *Ephimerides*, or any other way, accurately to finde out the place of the Sunne in his *Eclipticke* for the day propoſed, together with his declination: for the declination of the Sunne, the Sunne being in the ſix Northerne ſignes, ſubtracted from the Meridian altitude; or added, the Sunne being in the ſix Southerne ſignes, will preciſely giue the height of the Equator: or (which is the ſame) the *Meridian* heigth of the *Sun* in the *Equinoctiall:* which being once found, we may worke as in the former. By the Pole-ſtarre wee may likewiſe find it out, if wee obſerue it three diſtinct times in the ſame night: for three points being giuen, euery Geometrician will finde out the Center, which in this caſe muſt bee the Pole. Many other wayes haue beene inuented by skilfull Aſtronomers, which appertaining rather to *Aſtronomy* then *Coſmography*. I purpoſely omit.

24 Concerning the Horizon, two things are chiefly to bee noted, the *Inuention* and the *Diſtinction*. The Inuention is conſidered either as it concernes the Zenith or Pole: or the Plaine of the Horizon. For both which we will ſet downe theſe Rules.

1 *The height of the Pole ſubtracted from the quadrant of 90 Degrees: the reſidue will ſhew the Zenith or diſtance of the Zenith from the Pole.*

The reaſon is euident; becauſe the height of the Pole, together with the diſtance of the Pole and the Zenith make an arch, which is a whole quadrant: ſo that the height of the Pole ſubducted, the diſtance will remaine; as for example, if wee put the eleuation of the Pole here in *Oxford*, to be 51 ½ degrees or thereabout (as hath been formerly taught: Let theſe 51 ½ degrees bee ſubtracted from 90, then will remaine 38 ½, which is the true Zenith for that place.

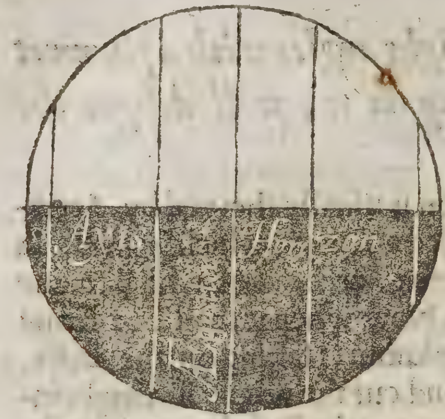
2 *A line which makes right angles with a plummet perpendicularly falling on it, will deſigne the Horizontall plaine.*

The practiſe of the propoſition is vſually ſhewed by Artificers by a certaine inſtrument called a *Leuell*, which is made in a triangle forme: from the vertex, or head of which, a line with a plummet fals on the Baſis. Now when it ſhall bee found to be ſo placed, that the line and plummet falling on the Baſis, ſhall make right Angles with it, and cut the whole Triangle into two equall halfes: wee may account the Baſe-line to bee the plaine of the Horizon: For of this plaine, ſuch is the poſition, that it inclines no more on the one ſide then on the other, but lies euen: as wee ſee in the ſurface of the water, when it reſts quiet without motion: for howſoeuer the water ſo reſting (as we haue formerly demonſtrated) is alwayes ſphericall, yet in a ſmall diſtance in the ſenſible Horizon, it may to ſenſe be repreſented by a plaine.

25 So much for the Inuention: The Diſtinction of the Horizon is into three ſorts: for either it is a right Horizon, or oblique, or parallell.

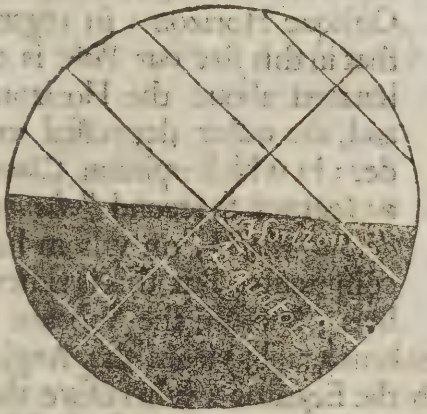
26 A right Horizon is that which with the Equator makes Right Angles.

This diſtinction growes naturally out of the Reſpect of the Horizon to the Equatour. For ſith the Equatour is one and the ſelfe-ſame immoueable circle; and the Horizon is mutable and changed according to his diuerſe verticall points, they cannot alwayes keepe the ſame ſituation in regard one of the other. This they haue reduced into three heads; for either it is *Right* or *Oblique*, or *Parallell*. The Right is ſo called from the right Angles which the Horizon makes with the Equator: wherein the two poles are alwayes couched in the Horizon, and the Equator paſsing directly ouer their heads, as is plaine to be ſeene in this figure here affixed: ſuch an Horizon haue theſe Inhabitants which dwell directly vnder the Equinoctiall line, in the very middeſt of the Torrid Zone: ſuch an Horizon agrees to a great part of *Africke*: to a part of *Peru* in *America*: Alſo to moſt of the *Molucco* Ilands, the Ilands of *Taprobana*, and S. *Thomas*: but no part of *Europe* is ſubiect to ſuch a Right Horizon. The cauſe of this variation of Horizons is the naturall roundneſſe of the Earth: For the earth being ſuppoſed to bee ſphericall, as we haue before demonſtrated, it muſt of neceſsity follow, that the ſite of the poles ſhould be changed according to the diuerſity of the places. Alſo, becauſe whereſoeuer we are placed on the Earth (as wee haue ſhewed) all impediments of the ſight, as mountaines and vallies put apart, we can behold the Hemiſpheare of the Heauens, which middle part being ſet downe is diuided from the part vnſeene, by the Horizon it muſt needs bee, that either both the poles muſt be in the Horizon: and ſo make a Right Spheare: or at leaſt one muſt bee aboue and ſeene, and the other hid from the ſight, and ſo much as one is eleuated aboue the Horizon, muſt the other bee couched vnder it. For otherwiſe wee ſhould ſee more or leſſe then a preciſe moity, or halfe of the Heauens: ſith the poles differ one from the other the halfe of the whole Heauens: to wit, by the Diameter of the world.



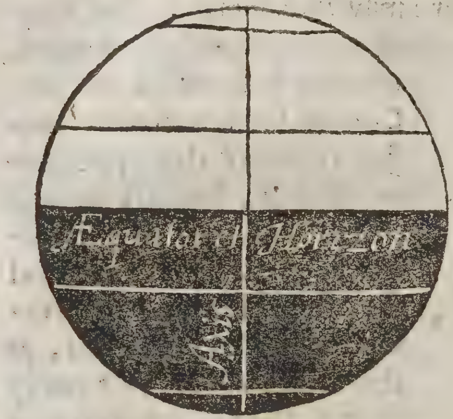
27 An oblique Horizon is that which with the Equator makes oblique Angles.

Thoſe Inhabitants are ſaid to haue an oblique Horizon, whoſe ſite and poſition declines ſomewhat from the Equator, either to the North or South towards either pole: yet ſo that the pole bee not eleuated ſo high as 90 Degrees: for then it becomes a *Parallell* Horizon, as wee ſhall ſhew in the next. The repreſentation of ſuch an oblique Spheare may bee ſeene in this Diagram: wherein the Horizon cuts the Equatour at oblique Angles, whence it is called *oblique*. *Clauius* ſeemes to adde another reaſon of this appellation: to wit, becauſe in ſuch an Horizon one pole is alwayes eleuated aboue, and the other hid: but this reaſon ſeemes too generall, as that which agrees not onely to an *Oblique*, but alſo to a *Parallell* Spheare. From this Horizon, by *Johannes de Sacrobôſco*, the Spheare is called *Artificiall*: becauſe, as *Clauius* coniectures, it is variable, and doth naturally diuide the Globe. For whereas the Horizon of the Right Spheare paſſeth by either Pole, it ſeemes by it ſelfe (as it were) Naturally and Directly to diuide the Spheare: and this diuiſion is no way variable, as that it ſhould bee more or leſſe Right: but contrariwiſe in the oblique Spheare, ſith one Pole is placed aboue, and the other beneath, it ſeemes to be placed out of his naturall ſite and poſition. Moreouer this Oblique Horizon is variable according to the diuerſity of habitations, ſo that it may be to ſome more, to others leſſe Oblique: for ſo much the more Oblique muſt it be, by how much the neerer it is placed to the Poles. The Inhabitants of an Oblique Spheare are ſuch as ſeated betwixt the Equator, and either of the Tropicks of *Cancer* and *Capricorne*, or ſuch as dwell betwixt either Tropicke and the Polar-circle.



28 A Parallell Horizon is that which lies Parallell to the Equator, making no angles at all with it.

Such a kinde of Horizon thoſe Inhabitants are ſaid to haue, which are included betwixt the Poles of the world, and the Polar circles; whoſe Horizon cuts not the Equatour at any Angles at all, either Right or Oblique: but lies Parallell vnto it, as we ſee in this Figure here ſet downe. Some haue reduced this kinde of Spheare to an Oblique Horizon: in regard that in this ſite our Pole is eleuated aboue the Horizon, and the other depreſſed vnder: in which opinion *Clauius* ſeemes to ſecond *Johannes de Sacroboſco*, on whom hee comments. But this is ridiculous; becauſe the Spheare is called *Right* or Oblique (as wee haue taught) from the Angles which the Horizon makes with the Equator: wherefore that Horizon which makes no Angles at all, cannot bee called either *Right* or Oblique, but is neceſſarily diſtinguiſhed from either. On this diſtinction of Horizons is grounded the diuiſion of the Inhabitants of the Earth according to three kinds of Spheares: of whoſe accidents and proprieties wee ſhall more fully treat hereafter in the dictinction of the parts and Inhabitants of the Terreſtriall Spheare, becauſe ſuch proprieties cannot ſo well be taught without the knowledge of the *Artificiall Spheare*, whoſe Nature and Fabricke wee ſhall labour (God willing) in our next Chapter to vnfold.



CHAP. VII.

Of the Artificiall Repreſentation of the Terreſtriall Spheare.

1 HAuing hitherto treated of the Terreſtriall Spheare, as it is Naturall or re-

all: wee are in the next place to ſpeake of the *Artificiall* Globe: The Artificiall Globe is an expreſſion or imitation of the Spheare of the Earth.

2 The Artificiall imitation of the Earth is either *Common* or *Magneticall*. The common is againe twofold; either in the *Globe*, or in the Geographicall *Mappe*, or Table.

3 The Geographicall Globe is a round ſolid Body, adorned with Lineaments & pictures, ſeruing for the vſe of Geographers.

Who was the firſt Inuentour of this Artificiall Globe, it is not euident: ſome thinke with *Pliny*, that it was found out by *Atlas*, and carried into *Greece* by *Hercules*. Others haue aſcribed it to *Anaximander Mileſius*; ſome to *Muſæus*, as *Diogenes Laërtius*: others to other Authors, amongſt whom *Architas Tarentinus* is not forgotten, as one that was eſteemed the rareſt Mathematician of his time. But all theſe were out-ſtripped by *Archimedes* the *Syracuſan* Mathematician, who is ſaid to haue compoſed a Spheare of tranſparent glaſſe, repreſenting vnto the life the whole frame of the Heauens, wherein the *Sunne*, *Moone*, and *Starres* with their true motions, periods, and limits were ſhewed to the ſight, in ſuch ſort, as if it were naturall: whereof *Claudian* the Poët elegantly wrote in theſe Verſes.

Claudian. in Epigrammat.

Jupiter in paruo cùm cerneret æthera vitro,
Riſit, & ad Superos talia dicta dedit:
Huccine mortalis progreſſa potentia curæ?
Jam meus in fragili luditur orbe labor.
Jura poli, rerûmq; fidem, legéſq; Deorum,
Ecce Syracuſius tranſtulit arte Senex.
Incluſus varijs famulatur ſpiritus aſtris,

Et viuum certis motibus vrget opus.
Percurrit proprium mentitus ſignifer annum,
Et ſimulata nouo Cynthia menſe redit.
Iamq́ ſuum voluens audax induſtria mundum,
Gaudet & humana ſidera mente regi.
Quid falſo inſontem tonitru Salmonea miror?
Æmula naturæ parua reperta manus.

In a ſmall glaſſe when *Ioue* beheld the Skies,
He ſmil'd, and thus vnto the gods replies:
Could man ſo far extend his ſtudious care,
To mocke my labours in a brittle Spheare?
Heauens lawes, mans wayes, and Natures ſoueraigne right,
This Stage of *Syracuſe* tranſlates to ſight.
A ſoule within on various ſtars attends,
And moues the quicke-worke vnto certaine ends.
A faigning *Zodiacke* runnes his proper yeere,
And a falſe *Cynthia* makes new monethes appeare.
And now bold Art takes on her to command,
And rule the Heauenly Starres with humane hand.
Who can admire *Salmonean* harmleſſe Thunder,
When a ſlight hand ſtirres Nature vp to wonder?

But this Spheare of *Archimedes* I take to be more then an ordinary Globe commonly vſed amongſt vs, as may appeare by the Poëts deſcription; ſo that it may rather be likened to the Spheare, lately compoſed by *Cornelius Trebelius*, and preſented vnto *King Iames*. The like whereof *Peter Ramus* ſayes he ſaw two at *Paris*; yet not of glaſſe, but of Iron; the one of which *Ruellius* the Phyſician brought from the ſpoiles of *Sicily*: the other of which *Orontius* the Mathematician recouered likewiſe from the *Germane* warres. But of ſuch kind of Globes hauing neuer yet had the happines to ſee any, I intend no deſcription: In the meane time our common Geographicall Globes may well ſerue our turnes.

4 In the Terreſtriall Globe two things are to be conſidered: 1 The Fabrick or Structure.

2 The Vſe. 3 The Direction. In the former is taught the compoſition of the Globe by reſoluing of it into it's parts.

1 *The parts whereof the Globe is Geographically compounded are circles and pictures.*

To explaine the true compoſition of the Artificiall Globe, not Phyſically as it conſiſts of timber and mettall, but *Geographically* as it repreſents the Earth, we are to conſider, that the parts of it are either *Externall* or *Internall*: Externall I call thoſe parts which are without the Spheare it ſelfe, yet neceſſarily concurre to the conſtitution of it. Theſe parts are ſuch as concurre to the making of the Stocke or Frame whereunto our Spheare is ſet: where to let paſſe the footing or lower board, (wherein in the old Globes was engraffed a *Marriners Compaſſe*, with a *Needle magnetically* touched, very profitable for the direction of the Spheare) I will onely ſpeake of the great Timber Circle, encompaſſing round the whole Globe: becauſe it more immediatly concernes our purpoſe. This Circle repreſents the *Horizon* of the Naturall Spheare: In the Globe it is made but one, not that there is but one Horizon in the whole Earth; becauſe (as we haue taught) the Horizon is varyed according to the places: but becauſe it is impoſſible to point and marke out the Horizons; for all places being infinite as the Verticall points: yet may this one ſerue for all places, becauſe the Globe being moueable, may apply all his parts to this circle. This Circle repreſenting the Horizon, is diuided into three borders or Limbes: whereof the firſt which is towards the Spheare, containes all the *ſignes* with the *Planets* thereunto belonging; euery of which is diuided into 30 Degrees, which in the Timber Circle are deſcribed by ſet numbers and markes. The ſecond which is the middle-moſt and largeſt, contaynes the Calendar, with the Golden number, and ſeuerall names of all the Feaſts throughout the yeare. The third and laſt is of the 22 Windes, ſeruing chiefly for the vſe of Marriners, and may ſerue many wayes for a *Geographer* to diſtinguiſh the *Coaſts* and points of the Earth. But of theſe three borders diſtinguiſhed in the Horizon, only the laſt hath vſe in *Geography*; the other two are in themſelues Aſtronomicall, and placed in the Geographicall Globe rather for ornament, then vſe. The Internall parts of the Globe are either annexed or inſcribed in the face of the Spheare. The Annexed part is that which repreſents the Meridian, which is a Braſen circle: For as the Externall Frame of the Globe contained the Horizon as one circle; ſo this Meridian is ſet but one, although it bee in it ſelfe various, according to the places to which it ſerue. Neither without good reaſon is this Circle made of *braſſe*, becauſe it ſhould ſerue for diuerſe vſes, which require that it ſhould bee often changed and turned to and fro, which being of Timber would miſcarry. This Braſen Meridian meetes with the Horizon at two oppoſite places, cutting it at right angles, that the Spheare included might bee rayſed and ſet lower, as occaſion requireth. The Meridian circle is agayne diuided into 4 *Quadrants*, each of which is againe diuided into 90 *Degrees*; ſo that on the one ſide the 90th Degree muſt touch the Pole; on the other ſide the firſt degree; ſo that in all there will ariſe 360 degrees, deſcribed in the Braſen Meridian. Through this Braſen Meridian by the two Poles doth paſſe a line or wier, which is called the *Axell-tree* of the Globe, about the which the Spheare is turned, the ends of which are commonly called the Poles; whereof the one repreſenting the *North point* is called the *Pole Articke*; the other ſhewing the *South*, is termed *Antarticke*. To this Meridian Circle in the Globe is commonly faſtned a little Braſen Circle, named *Cyclus horarius* or the *houre-circle*; but this rather appertaines to *Aſtronomy* then *Geography*, and therefore wee will forbeare to deſcribe it: ſomewhat more vſe haue wee of another Inſtrument faſtned to the Meridian, called the *Quadrant* of *Latitude*; foraſmuch as it may ſerue to meaſure the Diſtance betwixt any two places ſigned in the Globe: but in ſo groſſe an Inſtrument little exactneſſe can bee expected. Now for ſuch matters as are inſcribed in the Spheare it ſelfe, (to let paſſe ridiculous & idle pictures vſed of Painters for ornament) they are either Lines & Circles drawne on the face of the Globe: or elſe the pictures &

delineations of Countreyes and places, marked out in viſible proportions; whereof the former properly appertaines to the *Sphericall* part of Geography; the latter to the *Topicall.* The Circular Lineaments are againe twofold: either Circles neceſſarily appertaining to the conſtitution of the Globe; or elſe Lines thereon drawne to bee conſidered of Marriners, which we haue before called the *Rhumbes.* But theſe Lines alſo (as wee haue taught) appertaine to the *Geographer*, being as many ſections of the Horizontall Circle; becauſe they are alwayes imagined to proceed from a Verticall point wherein they meet. The Circles painted on the Globe are either the *Parallels* or *Meridians*, whoſe deſcription we haue ſet downe in the chapter before: Amongſt the Parallels the moſt remarkable is the *Equatour*, which is made greater then all the reſt, in forme of a bracelet, diſtinguiſhed into degrees, and marked at euery 10. degrees: Next to this are the Tropicks and Polar Circles, repreſented only by blacke Lines, yet framed in ſuch ſort, that they may eaſily bee diſcerned from other Parallels. Amongſt the Meridians the moſt notable is the firſt Meridian paſſing by the *Canaries*, and painted much like the *Equatour*, cut into diuers ſections and degrees, in ſuch ſort as wee haue deſcribed: For the Zodiacke which is vſually pictured in the Terreſtriall Globe, I hold it altogether needleſſe in Geography, and made rather for ornament, then vſe; for as much as the periodicke courſe of the Sun, deciphered by the Eclipticke, appertaines rather to the *Theory* of the planets, which is the hardeſt part of *Aſtronomy.* The proportion of theſe Circles, Site, and Diſtance is taught before, and needs no repetition, ſith it is the very ſame in repreſentation on the face of the Globe, which is really in the Earth it ſelfe. For the pictures and Topicall deſcription of the Earth, wee referre it to the ſecond and third part of this Treatiſe; where we ſhall haue occaſion to ſpeake of Countreyes and Regions, with their ſeuerall qualities, accidents, and diſpoſitions.

2 *The vſe of the Artificiall Globe is to expreſſe the parts of the Earth ſo farre forth as they*

haue a diuerſe ſituation as well one n reſpect of another, as of the Heauens.

The vſe of the Artificiall Globe is two-fold, either generall or ſpeciall: the Generall is expreſſed in this Theoreme: the Speciall ſhall be ſhewne in diuerſe ſpeciall propoſitions hereafter as occaſion ſhall ſerue.

5 This Direction is taught in the Rule.

1 The Meridian for the place being found by the Sunne or Compaſſe. 1 Let the Globe bee ſo ſet, that the North Pole reſpect the North, the oppoſite the South. 2 Let the Pole in the Meridian of the Globe be ſet according to the eleuation of the Pole at the place aſſigned.

6 A Geographicall Mappe is a plaine Table, wherein the Lineaments of the Terreſtriall Spheare are expreſſed and deſcribed in due ſite and proportion.

Some would haue the name of a Mappe to be drawne from the linnen furniture wherewith it is endorſed; which is not vnlikely, in regard of the affinity of the words in Latine. But more ſignificantly by others it is termed a Geographicall Table or Chart: A Mappe differs from a Globe, in that the Globe is a round ſolide body, more neerely repreſenting the true figure of the Earth, whereas contrarywiſe the Charts of themſelues are plaine, though repreſenting a Spheare, inuented to ſupply the wants of a Globe. For whereas a Globe is more coſtly to be procured of poore Students, and more troubleſome to be carried to and fro; a Mappe is more cheape to be bought, and far more portable: And howſoeuer it be not ſo apt an expreſſion as the Globe, yet are there few matters repreſented in the other, which may not in ſome ſort find place in this. And certainly ſuch is the vſe and neceſſity of theſe Tables, that I hardly deeme him worth the name of a Scholler, which deſires not his Chamber furniſhed with ſuch ornaments. It is written of that learned man *Eraſmus Roterodamus*, that hauing ſeene 50 yeares, he was delighted ſo much with theſe Geographicall Mappes, that vndertaking to write Comments on the *Acts* of the *Apoſtles*, he had alwayes in his eye thoſe Tables, where hee made no ſmall vſe for the finding out of the ſite of ſuch places whereof he had occaſion to treate. And it were to bee wiſhed in theſe dayes, that yong Students inſteed of many apiſh and ridiculous pictures, tending many times rather to ribaldry, then any learning, would ſtore their ſtudies with ſuch furniture. Theſe Geographicall Mappes are of two ſorts, either Vniuerſall or Particular: The Vniuerſall are ſuch as repreſent the picture of the whole Earth. The particular are ſuch as ſhew only ſome particular Place or Region. Theſe particular Tables are againe of two ſorts; ſome are ſuch as deſcribe a place in reſpect of the *Heauens*, whereon are drawne the Geographicall lineaments by vs deſcribed, at leaſt the chiefeſt: ſome againe are ſuch as haue no reſpect at all to the Heauens; ſuch as are the Topographicall Mappes of Cities and Shires, wherein none of the Circles are deſcribed. For the Vniuerſall and firſt ſort of particular Maps, there is no queſtion but they properly appertaine to Geography: But the later deſerue much leſſe conſideration, as being too ſpeciall for this generall Treatiſe.

7 The Geographicall Mappe is twofold: eithre the *Plaine Chart*, or the *Planiſpheare*: The Plaine Chart we call that which conſiſtes of one face and Right lines.

Such a Chart wee find commonly ſet foorth vnder the name of the Marriners *Sea-Chart*: for howſoeuer it ſeemes to haue chiefeſt vſe in Nauigation, yet is the Nature and vſe of it more generall: as that which not onely expreſſeth the *Sea*, but the whole Terreſtriall Globe: For as much as the *Parallels*, *Meri-*

dians, and *Rhumbes*, whereof primarily it conſiſts, are circles common to the whole, and not appropriated to either part.

8 In the *Plaine-Chart* we are to conſider two things. Firſt the *Ground*. Secondly the *Inſcription*. The *Ground* is the ſpace or Platforme wherein the Lines are to be inſcribed: the Inſcription teacheth the manner how to proiect the Lines.

In the Chart two things are remarkable; to wit, the plaine whereunto the Lines are inſcribed: Secondly the Lines or Inſcription it ſelfe: ſo wee are here to handle two points: Firſt how this *Plaine-Chart* ſhould bee conceiued to bee produced out of the Globe; whereof it is a repreſentation. Secondly what rule or method wee ought to vſe for the inſcription of the Meridians, parallels, Rhumbes, and other Lineaments thereunto annexed. Both which depend on theſe propoſitions.

1 *The Geographicall Chart is a Parallellogramme conceiued to be made out of a Spheare, inſcribed in a Cylinder, euery part thereof ſwelling in Longitude and Latitude, till it apply it ſelfe to the hollow ſuperficies of the ſaid Cylinder.*

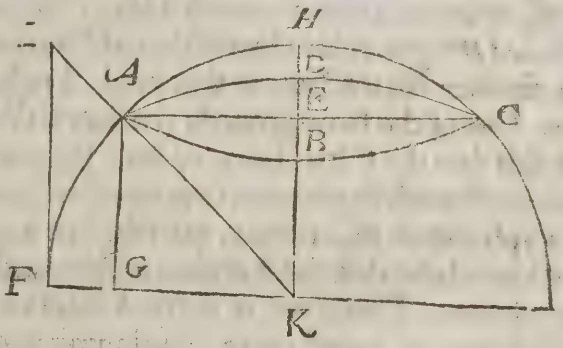
This Theoreme ſeeming at the firſt obſcure, conſiſts of many parts, which being once opened, will ſoone take light. Firſt then to know the Ground-worke of this *Parallellogramme* thus defined, wee muſt ſuppoſe a Sphericall ſuperficies, Geographicall or Hydrographicall, with Meridians and parallels to bee inſcribed into a concaue Cylinder, their Axes agreeing in one. Secondly wee muſt imagine the ſuperficies thus inſcribed, to ſwell like a bladder, blowing equally in euery part, as well in Longitude, as Latitude, till it apply it ſelfe round about, and all along towards either pole, vnto the concaue ſuperficies of the Cylinder; ſo that each parallell on this ſuperficies, ſucceſſiuely growes greater from the Equinoctiall towards either Pole, vntill it challenge equall Diameter with the Cylinder: and likewiſe all the Meridians growing wider and farther off, till they bee as farre diſtant euery-where as is the Equinoctiall one from the other. Hence may eaſily bee vnderſtood the true Mathematicall production or generation of this part: for firſt of a Sphericall ſuperficies it is made a Cylinder: and ſecondly of a Cylinder it is made a Parallellogramme, or plaine ſuperficies: For the concaue ſuperficies of a Cylinder is nothing elſe but a plaine Parallellogramme, imagined to bee wound about two equall equidiſtant circles, hauing one common Axell-tree perpendicular vpon the Centers of them both; and the *Peripheries* of them both, equall to the length of the Parallellogramme, as the diſtance betwixt thoſe Centers is equall to the bredth thereof: In this Chart ſo conceiued to be made, all places muſt needs be ſituate in the ſame Longitudes and Latitudes, Meridians, Parallels, and Rhumbes, which they had in the Globe it ſelfe: becauſe we haue imagined euery point betwixt the Equatour and the Poles, to ſwell equally in Longitude and Latitude, till it apply it ſelfe to the concauity of the Cylinder: ſo that no point can bee diſplaced from his proper ſeat, but only dilated in certaine proportion. And this I take to bee the beſt conceit for the ground-worke or platforme of this Geographicall Chart.

2 *Except the* diſtances *betwixt the* Parallels *in a* Plaine-Chart *be varied: it cannot bee excuſed from ſenſible errour.*

It hath beene thought by many Geographers, that the Earth cannot aptly according to due ſymmetry and proportion be expreſſed in a plaine ſuperficies, as it is in the Globe: for as much as that which is ioyned and vnited in the Globe, being of a Sphericall figure, is in the Mappe extended and dilated to a diuerſe longitude and latitude from that Sphericall delineation: and although it hath been generally conceited by many writers, that no due proportion could bee obſerued in a Sphericall ſuperficies, without ſenſible errour: yet moſt exception hath beene made againſt this *Chart* here mentioned, conſiſting of one face and ſtraight lines, which in ſubſtance (if we cōſider the Circles) differs not from the Nauticall Chart: of whoſe errours *Martin Corteſe*, *Peter Nonnus*, and many others haue complained: which eſcapes are excellently opened and reformed by our Countryman *Edward Wright* in his Correction of Nauticall Errours. The reaſon or ground which drew theſe men to thinke that the Earth could not bee proportionably deſcribed in a plaine ſuperficies, proceeded from the common proportion of the Lines and Circles on the Chart. For ſuppoſing the Parallels cutting the Meridians at equall Angles, to obſerue an equall diſtance euery-where one from the other; theſe errours and abſurdities muſt of neceſſity enſue. Firſt, what places ſoeuer are delineate in the ordinary Chart, the length of them from Eaſt to Weſt hath a greater proportion to the bredth from North to South then it ought to haue, except onely vnder the Equinoctiall: and this errour is ſo much the more augmented, by how much thoſe places are diſtant from the Equinoctiall: for the neerer you approach the Pole, the proportion of the Meridian to the Parallell ſtill increaſeth; ſo that at the Parallell of 60 degrees of latitude, the proportion of the length to the bredth is twice greater then it ought to bee; for as much as the Meridian is double to that Parallell, and ſo in all the reſt: whence as *Edward Wright* obſerues, the proportion of the length of *Frieſland* to the bredth thereof, is two-fold greater then in the Globe which expreſſeth the true proportion; becauſe the Meridian is double to the Parallell of that Iland. In like ſort it is plaine, that in the Ilands of *Grock-land* and *Groenland*, the length to the bredth hath a foure-fold greater proportion in the Common Chart, then in the Globe; becauſe the Meridian is foure-fold greater then the Parallell of thoſe places. Wherefore it cannot be conceited, that the manner of finding out the difference of Longitude by the common Chart, can bee any-where true without ſenſible errour, except onely vnder the Equinoctiall, or neere about it; becauſe in no other place the Parallell is equall to the Meridian. In other places the errour will bee ſenſible, according to the difference of the Meridian, and Parallell of that place: whereas if the contrary were granted, it would follow, that two ſhips ſayling from North to South, vnder two ſeuerall Meridians, would keepe the ſame diſtance the one from the other of longitude neere the Pole, which they had neere the Equatour; which is impoſſible: becauſe Meridians cannot bee Parallell the one to the other, but by how much they approach the Pole, by ſo much they are neerer, that in the end they all concurre and meete in the Pole it ſelfe. Secondly this common Chart admitted, there would ariſe great errours not onely in the ſituation of diuers places, which appeare to bee vnder the ſame Meridian, but alſo in the *bearing* of places one to the other. The reaſon is manifeſt, for that the Meridian is a certaine Rule of the ſite and poſition of places: therefore whenſoeuer any errour ſhall be committed in the Site and Poſition of the Meridian, there muſt needs follow errours in the deſignation of the Rhumbes, and other points of the Compaſſe. And therefore euery reſpectiue poſition of place to place, ſet downe in the common Chart, cannot bee warranted. A pregnant example wee haue in the way from *India*; for the Promontory of *Africke*, called the Promontory of three Points, hauing of Northerne latitude 4 Degrees and a halfe, and the Iland of *Triſtan*, *Acugna*, hauing 36 degrees of Southerne latitude, are in the common Chart ſet vnder the ſame Meridian: But the Chart ſheweth the diſtance betweene theſe Ilands, and the *Cape of good Hope* to come neere to 400 leagues; both which cannot ſtand together; for if all the coaſt from the Promontory of *Three Points*, vnto the Cape of *Good-hope* be rightly meaſured, and the Promontory of Three Points lye alſo vnder the ſame Meridian with thoſe Ilands, yet muſt the diſtance bee much leſſe: But if it be not leſſe, it cannot ſtand with reaſon that it ſhould haue the ſame Meridian with the Promontory of Three Points, but muſt needes lye more Weſtward. Thirdly, there muſt needs ariſe a greater errour in the tranſlating Sea-coaſts and other ſuch places out of the common Chart, into the Globe; becauſe they haue only a reſpect to the Numbers of Degrees of Longitudes and Latitudes found therein; ſo that not onely errours appeare in the Sea-Chart, but alſo other-where thence deriued. Theſe and many more errours haue been detected in the common Sea-chart, which (as we haue ſaid) reſpecting the circles, ought to be imagined one and the ſelfe-ſame with the proiection of the lines in a Geographicall table; which ouerſight *Ger. Mercator* in his vniuerſall Map ſeemes to correct: yet leaues no demonſtration behind him to teach others the certaine way to draw the Lines, as Meridians, Parallels, & Rhumbes on the Chart, in ſuch ſort, as theſe errours might be preuented, and the due proportion and ſymmetry of places well obſerued. But our induſtrious Countryman hath waded through all theſe difficulties, and found out the true demonſtration of a proiection of theſe Lines to be inſcribed in the Chart in ſuch ſort, as no ſenſible errour can ſhew it ſelfe, from whoſe copious induſtry wee will extract ſo much as may ſerue our purpoſe, onely contracting his inuention into a ſhorter method, hauing many matters to paſſe through in this Treatiſe.

2 *The Diſtances of the Parallels in the Chart muſt encreaſe proportionably as the Secantes of the latitude.*

It hath been a conceiued errour (as we haue ſhewed) that all the parallels in the Chart here mentioned, ſhould euery-where keep the ſame Diſtances one from the other, from the Equator to the poles; yet becauſe no man (for ought I know) hath out of Geometricall grounds diſcouered the true proportion, beſide my fore-named Author; I muſt herein alſo follow his direction as neere as I can in his owne footſteps; becauſe I would not any way preiudice his Inuention. Firſt therefore wee muſt conſider in that Chart, becauſe the parallels are equall one to the other, (for euery one is ſet equall to the Equinoctiall) the Meridians alſo muſt bee parallell and ſtraight Lines, and by conſequence the Rhumbes, making equall angles with euery Meridian, muſt bee alſo ſtraight lines. Secondly, becauſe the ſphericall ſuperficies whereof the Chart is imagined to be produced, is conceiued to ſwell and enlarge it ſelfe euery-where equally, that is, as well in Longitude as Latitude, till it accommodate it ſelfe to the hollowneſſe of the Cylinder round about: therefore at euery point of Latitude in this Cylinder ſo dilated, a part of the Meridian obtaines the ſame proportion to the like part of the Parallell, that the like parts of the Meridian and Parallell haue to each other in the Globe without ſenſible errour. Now for as much as like parts of the wholes, haue the ſame proportion that theſe wholes haue; therefore the like parts of any Parallell or Meridian of the Spheare haue the ſame proportion that the ſame Parallels and Meridians haue: For example ſake, as the Meridian is double to the Parallell of 60 Degrees, ſo a Degree, Minute, or other part, is alſo double to a Degree, Minute, or other part of the Parallell; and what proportion the Parallell hath to the Meridian, the ſame muſt their Diameters and Semidiameters haue one to the other: as is taught by Geometricians. Now the Signe of the Complement of the Parallels latiude or diſtance from the Equinoctiall, is the ſemi-diameter of the ſaid Parallell; as in this Diagramme here inſerted may eaſily appeare: for A E the ſigne of A H the complement of A F, the latitude of the Parallell A B C D from the Equinoctiall is the ſemi-diameter of the Parallell ABCD; and as the ſemi-diameter of the Meridian or whole ſigne is to the ſemi-diameter of the Parallell; ſo is the ſecant or Hypotenuſe of the Parallells latitude to the ſemi-diameter of the Meridian, or to the whole ſigne, as F K (that is) A K, to A E (as is) G K, ſo is I K to F K: therefore in this Geographicall Chart, the ſemi-diameter of each Parallell being equall to the ſemidiameter of the Equinoctiall or whole ſigne, the parts of the Meridian at euery point of latitude, muſt of neceſſity encreaſe with the ſame proportion wherewith the Secants of the Arch contained betweene theſe points of latitude and the Equinoctiall encreaſe: out of which Geometricall grounds,



grounds thus explained, will ariſe a certaine and eaſie methode for the making of a table by the helpe of Trigonometry, whereby the Meridian in any Geographicall or Hydrographicall table may truly and in due proportion diuide it ſelfe into parts, from the Equinoctiall towards either Pole: for taking for granted, each diſtance of each point of latitude, or of each Parallell one from the other, to comprehend ſo many points as the ſecants of the latitude of each point or Parallell containes, wee may draw out a table by continuall addition of the ſecants anſwerable vnto the latitude of each Parallell, vnto the ſumme compounded of all the former Secants; beginning with the ſecants of the firſt Parallels latitude, and thereunto adding the ſecond Parallels latitude, and to the ſumme of both theſe, adding the third Parallels latitude, and ſo forth in all the reſt: and this Table will ſhew the ſections and points of latitude in the Meridian of the Geographicall Mappe; through which ſections the Parallels ought to bee drawne: which Table wee haue lately ſet out by *Edward Wright* in his Correction of Nauticall Errours, to whom for further ſatisfaction in this kind, I referre the diligent Reader. Out of the ſame grounds we may alſo deduce the Rumbes: for ſith that the Chart (as wee haue ſhewed) is nothing elſe but a plaine *Parallellogramme*, conceiued to be made of the extenſion of a Sphericall ſuperficies, inſcribed in a concaue Cylinder, it muſt needs be that the Rumbes make equall Angles with all the *Meridians*. Therefore if in the Chart a circle be drawne, diuided into 32 equall parts, beginning with the *Meridian*, paſſing by the Center of that Circle, the lines drawne from the center of theſe ſections, will be the Rumbes for that place.

9 Of the Geographicall *Plaine-Chart* wee haue ſpoken; It behoues vs next to treate of the *Geographicall Planiſpheare*. The Planiſpheare is a table or mappe of two faces, whereon the lines are proiected circularly.

Betwixt the Planiſpheare and the Plaine-Chart, a double difference may be obſerued: 1 That the former conſiſts altogether of right lines, aſwell in regard of the *Parallells* as *Meridians*: whereas the later is compoſed of circular or crooked lines, as well as right. 2 The former may well bee expreſſed in one forme or front, as we may ſee not only in the Nauticall and common Chart, which wee haue ſhewne to be all one with the other in reſpect of theſe Lines; but in many other common Maps, as namely thoſe of *Hondius*, whereas the Planiſpheare cannot be expreſſed without two faces or Hemiſpheares; whereof the one repreſents the Eaſterne, the other the Weſterne part of the Terrene Globe: For herein wee muſt imagine a Globe to be cut into two equall Hemiſpheares, which are at once repreſented to our ſight: of this Deſcription of the Earth by crooked Lines, *Ptolomy* in his 24 Chapt. of his Geography hath taught vs two wayes: whereof the firſt depends from the aſpect of a Spheare, turned and moued round, in which all the Meridians are deſcribed as right Lines; but the Parallels as circumferences or crooked Lines. The other Delineation takes his ground from a Spheare repreſented to the ſight, not moued, but reſting ſtill in his place, in which both Meridians and Parallels are drawne circular. Theſe two wayes of *Ptolomy* (howſoeuer iudiciouſly inuented in thoſe times, wherein a ſmall part of the Earth was diſcouered, and Geography very vnperfect) haue beene by later Geographers much reformed and corrected. Yet amongſt the later haue not all expreſſed themſelues alike: ſome haue pourtrayed out of the Earth in faſhion of a Heart; ſome according to other figures: but in this (perhaps) as Painters, they haue beene more indulgent to fancy, then common vſe: others haue gone about to expreſſe the Globe of the Earth in Elipticke Lines, which the *Machanicians* call ouall. But wee as well in this as other matters, preferring choice before abundance, will content our ſelues with one or two, which vſe hath ſtampt more current, and experience hath found moſt vſefull: to which as a ground we will premiſe this Theoreme.

1 *The Planiſpheare is grounded on a certaine*

aſpect of the Terreſtriall Spheare, wherein the Eye of the beholder is ſo conceiued to bee fixed in ſome point of the Globe, that it may ſee the one halfe or Hemiſpheare.

Concerning the poſition of the Eye, two things are here remarkable: 1 Where the Eye is ſuppoſed to bee placed either aboue the conuexe ſuperficies, or in the concaue: ſome ſeeme to place it aboue the conuexe ſuperficies; of which opinion *Gemma Friſius* ſeemes to be, who would haue the Eye to be ſet at an infinite diſtance: others although not admitting of ſuch an infinite diſtance, deny not the Eye to bee aboue the conuexe ſuperficies: but neither way can be warranted: Not the former, becauſe of the impoſſibility of the ſuppoſition. For to imagine the Eye to bee ſet at an infinite diſtance, were to deny a ſight or aſpect which they would haue to bee the ground of this projection: For no object can bee perceiued, but ſuch as is bounded and determined in a certaine and proportionate ſpace. Neither can the later way paſſe cleere without exception; becauſe to ſuch a projection, ſuch a ſight is required which can ſee the whole Hemiſpheare: for otherwiſe would it be vnperfect, and want of the perfection of the Globe: which containes two abſolute and entire Hemiſpheares. But now no place can be imagined without the Globe, wherein the Eye can be ſo placed, as to ſee the one halfe or Hemiſpheare: for as much as it is impoſſible from the oppoſite points of any Diameter, to draw two tangent lines which may meet together, or cut one the other in the ſame point, but will bee Parallell the one to the other: wherefore wee may conclude, that the Eye in this projection cannot be imagined without the conuexe ſurface of the Spheare, but rather in the concaue: How the Eye ſhould bee imagined to be in the concaue ſuperficies, may be in this ſort explayned: wee muſt ſuppoſe a great Sphcare of the Glaſſe, or other ſuch Diaphanous matter, inſcribed with all his Parallels and Meridians, in ſuch ſort as they are repreſented vnto vs in the Globe, the Eye (according to opticall Principles) may bee ſo placed neere the

Center of it, as it ſhall bee able to ſee preciſely the one Hemiſpheare deſcribed with al his circles, as we find it in the ſpheare. I ſay *neere* not in the Center: becauſe the *Angle* of viſion (as we finde it taught in the *Perſpectiues*) doth not extend to a right Angle, but is ſomewhat leſſe: 2 we muſt inquire in what point in the ſuperficies the eye is placed. To which wee anſwer, that the place of the eye is of it ſelfe indifferent; becauſe it may bee imagined any where in what point ſoeuer. Neuertheleſſe wee will only faſten on two eſpeciall wayes which are of moſt vſe, wherein the propoſitions following ſhall informe vs.

9 This Planiſpheare is twofold: the firſt we tearme equinoctiall, which ſuppoſeth the eye to be fixed on ſome point of the equinoctiall circle; the other Polar, wherein the ſight is conceiued to bee fixed on the Pole of the Terreſtiall Globe: The ground and fabricke of the former is taught in theſe Propoſitions.

1 *The eye conceiued to be fixed on any point of the equatour, will deſigne out vnto vs a Planiſpheare wherein all the circles are proiected circularly, except the Equator and that Meridian which paſſeth by the ſaid point.*

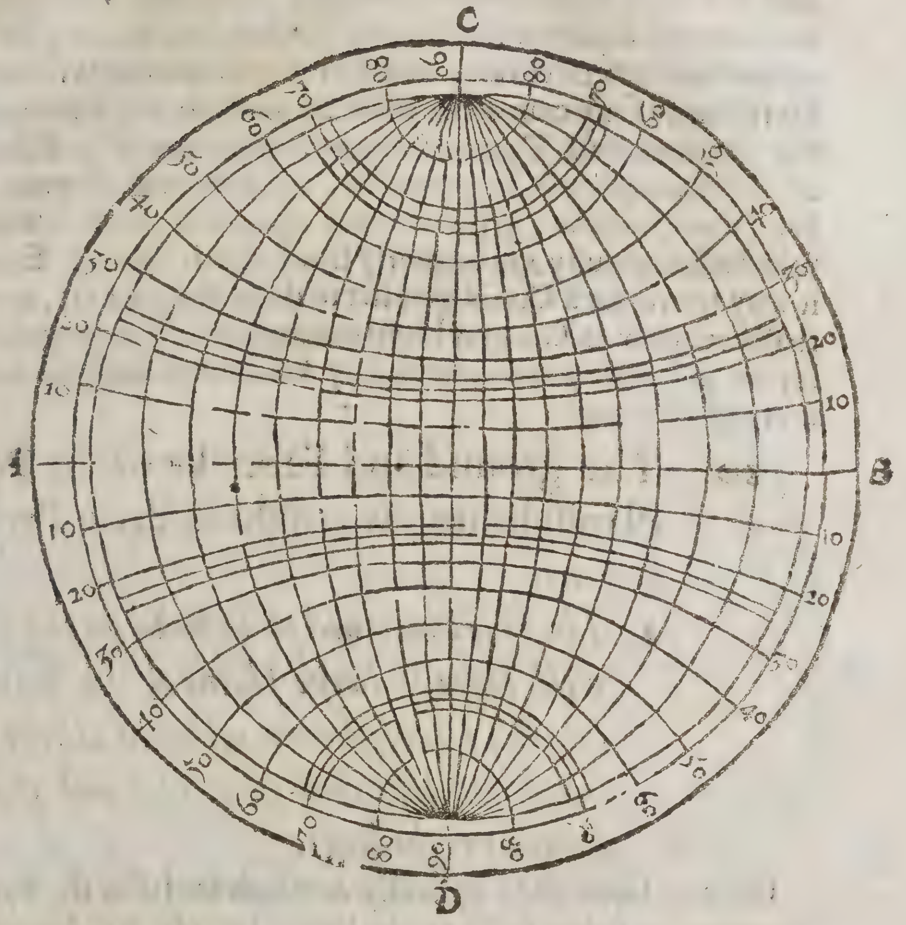
This may eaſily bee ſhewne out of the Opticke principles, we will ſuppoſe for example ſake the eye to bee placed in ſome point of the Equatour: which ſhall bee 90 degrees of longitude from the Equinoctiall point: which kinde of proiection wee haue in many of our common Geographicall Maps of the earth. In this manner of ſight, if the terreſtriall Hemiſpheare, which may only be comprehended by it, be diſtinguiſhed by his Parallells and Meridians ordered and ranged by diſtances of equall

Arches

Arches in ſuch number as we pleaſe: It is moſt certaine that the Eye, ſeeing diſtinctly and ſeparatly euery one of theſe Meridians and Parallels, will forme to it ſelfe ſo many viſuall Pyramides; called by Geometricians Cones, which cones by this meanes will be Scalenes, and will haue for their Baſes thoſe Meridians and Parallels, the tops whereof will meet together in the ſame point and eye of the beholder, which according to this ſuppoſition is the Pole of the Meridian, which paſſeth by the Canaries, called the firſt Meridian, and repreſenting vnto vs the Equinoctiall colure. Now becauſe theſe lines are cut by the plaine of the Meridian paſſing by the Canaries, it followes out of the ſame grounds, that their common ſections, and that of the Meridian are the proportions of circumferences, which repreſent vnto vs in this Plaine the Meridians and Parallels ſeene in this manner of ſight. Notwithſtanding that which is vnder the 90 degree of longitude, as likewiſe the Equatour, cannot (according to Opticke demonſtration) be ſeene, but as right lines cutting one the other at Right Angles in the Center of the ſame Meridian of the Canaries: The Theory being expreſſed we will in the next propoſition ſhew the manner of proiection.

2 *How to deſcribe the Meridians and Parallels in the Equinoctiall Planiſpheare.*

To ſhew the practiſe of this Theoreme, let there be drawne a circle A C B D, as you ſee in this figure diuided by two Diameters cutting on the other at right Angles in the Center into foure Quadrants, or equall parts: whereof each one is againe to bee diuided into 90 degrees. In this the line A B is imagined to expreſſe the halfe of the Equatour, as the line C D of the Meridian; in which the two points C and D deſigne out the two Poles. Let a rule bee drawne from the Pole C by euery tenth or fift degrees of the halfe circle A D B, and let euery ſection of the Equatour and the rule be preciſely noted. In like ſort from the point B let the Rule bee moued by euery fift and tenth Degree of the ſemicircle C A D, and let euery ſeuerall Interſection of the rule and the Meridian C D bee preciſely noted. Then placing



cing one foot of the compaſſe in the line CD (which muſt bee drawne out longer, becauſe in it the Centers of the Parallels muſt be found out) let the other be moued in order to euery interſection of the Meridian noted out: and let ſo many circles be drawne as interſections, which circles will bee ſo many Parallels. The finding out of the Centers where the ſtedfaſt foot of the compaſſe ought to bee fixed in drawing of each circle, is a matter appertaining to Geometricians: who haue taught a way to bring any three points giuen into a circle, and to finde the Center from which it is deſcribed. Hauing thus deſcribed the Parallels, wee muſt proceed on to draw the Meridians in this manner: let the one foot of the compaſſe bee placed in the line A B, from which as the Center by euery Interſection of the rule, and the Equatour forenoted, let there bee drawne ſo many circles as interſections; which circles ſo drawne will be the Meridians. If any man deſire more curiouſly to bee informed in the Geometricall Demonſtrations, whereon this Fabricke of the Planiſpheare is grounded, let him read *Gemma Friſius de Aſtrolabio*, *Stifelius*: but eſpecially *Guido Vbaldus*, who hath copiouſly and accuratly handled this ſubiect. Enough it may ſeeme for a Coſmographer to ſhew the vſe of it, as wee ſhall hereafter in Geographicall concluſions, ſuppoſing the Fabricke ſufficiently demonſtrated by Geometricians, to whom it of right belongs.

10 The ground and Fabricke of the Polar Planiſpheare, is taught in theſe Propoſitions.

1 *The Eye conceiued to be fixed on the Pole will expreſſe in the plaine of the Equinoctiall a Planiſpheare, wherein all the Parallels are deſcribed by circles and Meridians by right lines.*

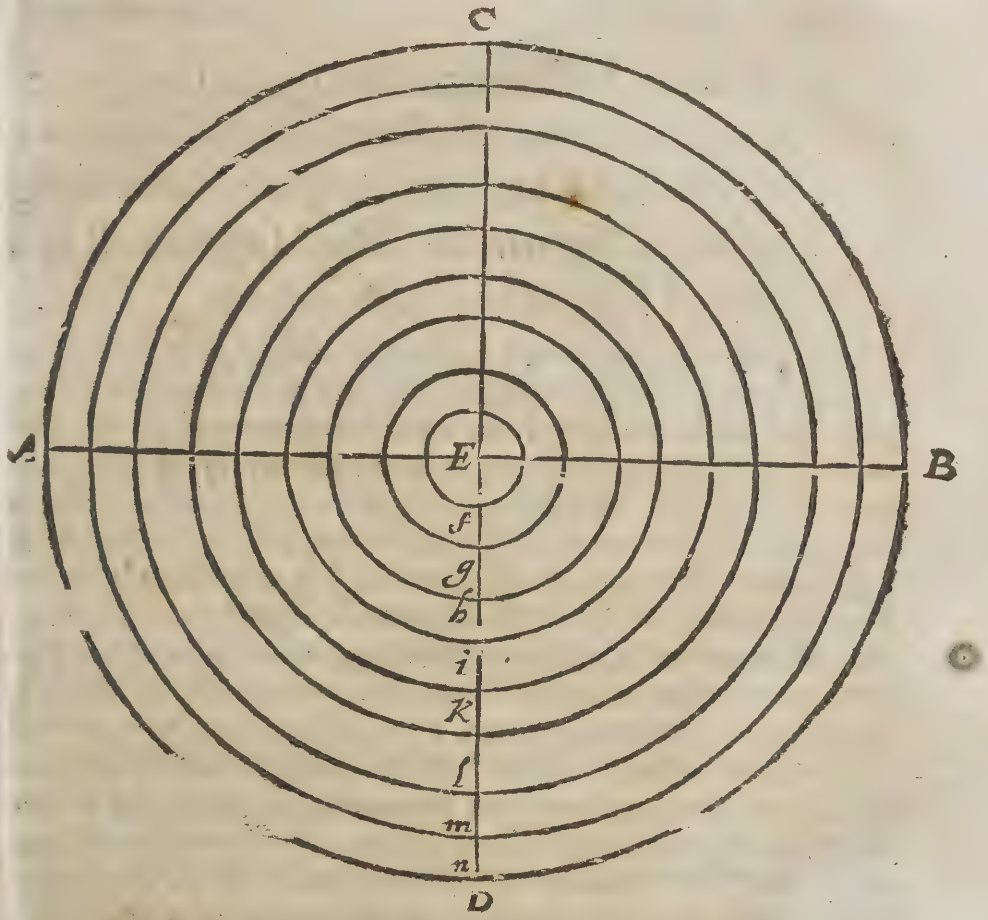
This may likewiſe be optically demonſtrated: For the Eye being ſuppoſed to bee fixed on the Pole, the ſight will forme to it ſelfe ſo many viſuall Cones as there are Parallels deſcribed in the Spheare. Theſe cones being ſuppoſed equally to be cut by the plaine of the Equatour, will haue for their Baſes the ſaid Parallell circles repreſented in the plaine of the Equatour, as ſo many abſolute circles; whereof the Equatour will be the greateſt, and comprehending within it all the reſt. Likewiſe the Meridians in this kinde of ſight are ſuppoſed to terminate the ſides of theſe Cones, and therefore according to the Opticks ought to be right lines.

2 *How to deſcribe the Parallels and Meridians*

in

in the Polar Planiſpheare.

This proiection is eaſieſt of all, as ſhall appeare by this Diagram. Let there be deſcribed a circle from the Center E which ſhall be A C B D: Let the circle be by two Diameters A B and B C diuided into foure quadrants: each of which may againe bee diuided into 90 parts: euery fift or tenth of theſe 90 parts being firſt marked out, ſo many Diameters may bee drawne from either ſide to the oppoſite part by the Center E: which Diameters ſo drawne will ſerue for the Meridians. Then let any one of theſe lines bee diuided into 9 parts, and diligently marked out, as the Semidiameter E D by F G H I K L M N: by

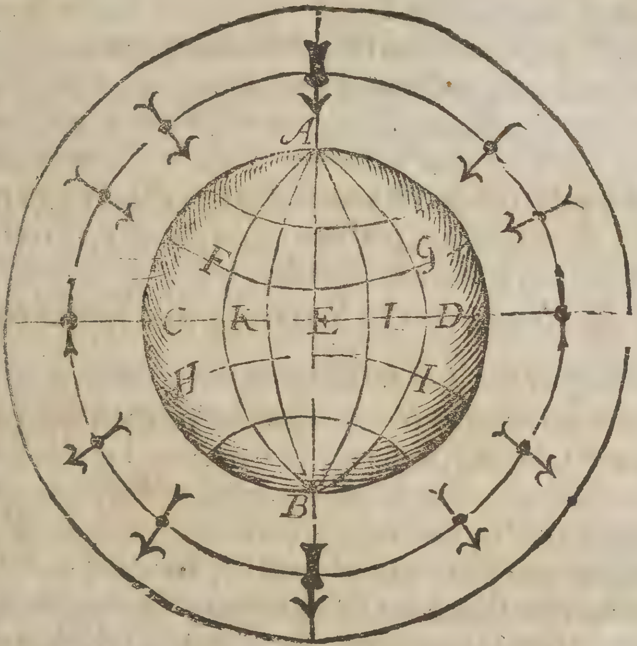


all which marks from the Center E, let there be drawne ſo many circles. Theſe circles ſo deſcribed will be the true Parallels: This kinde of proiection, though more vnuſuall, yet wants not his ſpeciall vſe in deſcribing the parts of the earth neere the Pole, which in our ordinary kinde of Tables proiected after the other manner, cannot ſuffer ſo large and proportionall a Deſcription.

11 Hauing hitherto treated of the *Common* repreſentation of the Terreſtriall Globe, we are in the next place to ſpeake ſomething of the *Magneticall.* The Magneticall is a round Magnet called a *Terrella.*

This kind of ſpheare hath been by *Gilbert* aptly termed a *Terrella,* or little Earth, being the modell and repreſentation of the great and maſſie Spheare of the earth whereon wee dwell. Betwixt this kind of repreſentation & the former, great difference may bee obſerued. Firſt becauſe the former is grounded merely on *Artificiall Jmitation*, implying nothing elſe but a *Reſpect* or application: whereas this magneticall *Terrella* not only repreſents externally the Earth, but Internally out of its owne *Magneticall* nature and vigour, eminently containes and expreſſes all thoſe motions and magneticall vertues, which we haue formerly ſhewed to bee in the Earth. 2 It skills not in the former of what *Materiall ſubſtance* the Spheare conſiſts, ſo the parts of it anſwer in due ſymmetry and proportion to the parts of the Earth; but this repreſents the whole as a *Homogeneall* part communicating the ſame nature & ſubſtance with the whole ſpheare of the earth: In the *Fabricke* of this inſtrument wee muſt conſider, 1 the *Matter*: 2 the *Forme*: The matter (as wee haue already intimated) is a *Magneticall* ſubſtance which ought to be choſen out of a moſt eminent Mine, hauing all his parts pure and vnmixt, as poſſible wee can finde in any Magnet. For though all Loadſtones haue the ſame inclination, yet in many the vigour is ſo weake, or at leaſt ſo hindered by the mixture of ſome *Heterogeneall*

geneall matter, that they will not ſo well and ſenſibly performe their office. The forme of it is the roundneſſe & politure, wherin Art ſhould ſhew as much exactneſſe as ſhee can: ſuch a Spheare may well be expreſſed in this Figure, whereof we had formerly occaſion to make vſe: wherein the footſteps of this Magneticall vigour are ſenſibly expreſſed, no otherwiſe then in the great Body of the Earth.



12 In this Magneticall Terrella two things are chiefly to bee noted, 1 the inuention of the Poles, 2 of the *Parallels* & *Meridians*: both which ſhall be taught in theſe Propoſitions.

1 *To finde out the Poles in the Magneticall Terrella.*

To performe this concluſion many artificiall wayes haue been inuented, 1 By the *Inclinatory* Needle: for being euenly hung in ſuch ſort vpon the Terrella, as may be ſeene in the former figure it will according to diuers points diuerſly reſpect the Terrella in his ſite : whereſoeuer then wee ſhall finde it to fall perpendicularly as right angles ; wee may aſſure our ſelues that that very point is the Pole : which being once knowne , it will be eaſie to finde the oppoſite Pole , either the ſame way , or by meaſuring. 2 By the Veyne or Mine of the Loadſtone : for (as wee haue ſhewed in our fourth Chapter of this Treatiſe) that part which was ſituated towards the North , will afterwards direct it ſelfe Southward , and contrariwiſe , the South point will reſpect the North, whence the Poles may be diſcouered. 3 By a little boat, wherein the Loadſtone being placed on the water , will moue round till ſuch time as with one Pole hee may point out the North, with the other the South. Many other wayes may be inuented by Mechanicians, perhaps more curious , to whoſe induſtry I referre my ingenious Reader.

2 *The circles in the Terrella are found out by the Magneticall Needle.*

This needs no other ocular demonſtration then we haue taught in the fourth Chapter, and may be conceaued in the former Diagramme; Firſt wee ſee the magneticall needle according to diuerſe points diuerſly to conforme it ſelfe, which hath giuen way to ingenious artificers to finde out the Parallels and Meridians. The Parallels are found out by obſeruing the Angles of declination of the Needle hung ouer the Terrella which are found in proportion to anſwer to the degrees of Latitude; which Dr *Ridley* in his Magneticall Treatiſe hath induſtriouſly calculated , as I haue here inſerted , to ſaue others a new labour of calculation. The Meridians are more eaſily found by hanging any directory wier or needle ouer the Terrella ; one end of which pointing towards the North , and the other towards the South , will diſcouer the Meridian line.

CHAP. VIII.

Of the meaſure of the Terreſtriall Globe.

1 HItherto haue we handled the Terreſtriall Globe primarily : in ſuch proprieties as abſolutely agree vnto its nature. In the ſecond place we are to handle ſuch as ſecondarily ariſe out of the former. Here wee are to handle two chiefe points. 1 The *Meaſure.* 2 The *Diſtinction.*

2 The meaſure is that by which we find out the quantity of the whole Earth.

Good reaſon haue we to cal this the *Secondary* part of *Geography*; for as much as theſe accidents and proprieties we here conſider, ariſe altogether out of the former. In the former Treatiſe wee haue diuided the *Naturall* Spheare of the Earth, from the Artificiall : But in this part, for auoiding of tedious repetitions of the ſame things, wee haue ioyned them together : For howſoeuer the meaſuring and dictinctions of the Earth bee truely grounded on the nature of the earth it ſelfe; yet can it not be well expreſſed and taught without the materiall Inſtrument: we haue therefore thought good to conſider the meaſure of the earth, before wee come vnto the Diſtinction, becauſe it is more ſimple and vncompound, depending on the lineaments and meaſure of one circle : whereas the Diſtinction neceſſarily requires the coniunction and combination of diuerſe circles, as *Meridians* and *Parallels* compared one with the other, as ſhall bee taught hereafter. Whether the great maſſe of the earth can bee meaſured, or no, ſeemes a matter not agreed on by all ; Some haue held an opinion that it cannot bee meaſured, in regard of the infinite magnitude wherewith they thought it endowed: which opinion ſeemes deriued from ſome of the *Platonicks*, who aſcribing to the Earth another figure beſides the *Sphericall*, haue caſt themſelues vpon vncertainties, and being not able to reduce the Quantity of the Earth according to their owne grounds to any certaine meaſure, haue denied it to bee meaſurable: But the ground of this opinion wee haue taken away before, in prouing the earth to be of a true Sphericall nature and therefore circumſcribed in certaine bounds apt to be meaſured. Another conceit more abſurd then the former, is not only the common people, whoſe condition might excuſe their ignorance, but of ſuch as would bee eſteemed learned; who contend, that the greatneſſe of the earth cannot bee meaſured: the onely reaſons they can alleadge for themſelues are, 1 That a great part of the earth is vnaceſſible by reaſon of ſteepe rocks, high mountaines, ſpacious and thicke woods, mooriſh fogges, and ſuch like impediments. 2 That the parts of it are for the moſt part vneuen, and ſubiect to no regular figure, without the which no meaſure can bee exact. The firſt cauill is of no moment; becauſe whereas wee affirme that the Earth by man may be meaſured, we hold it not neceſſary that it ſhould be trauerſed ouer by iourneyes or voyages. For as much as to the finding out of the Quantity of the whole Terreſtriall Spheare, it may ſeeme ſufficient to know the meaſure and proportion of any little part in reſpect of the Heauens. As for example, what number of *Miles*, *Leagues*, or *Furlongs* anſwer to any *degree* or *degrees* in the Heauens: wherfore we ſuppoſe the Earth to be meaſured ouer not with our feet, but with our wits, which may by Mathematicall rules be taught to march forward where our legges fayle vs: The ſecond obiection only proues thus much, that the Earth partaking of ſo many vnequall parts and irregular formes, cannot in the meaſuring admit of ſo much exactneſſe, as if it were endowed with one vniforme face: yet it is exact enough to content a *Coſmographer*, who meaſureth not by feet and inches, but by leagues and miles, in which wee little regard ſuch a needleſſe curioſity.

1 *The common meaſure by which the quantity of the Earth is knowne, are* Miles *and* Furlongs.

Here is to be noted that ſuch inſtruments as ſerue for meaſuring are of two ſorts, either greater or leſſer; the ſmaller are of diuerſe ſorts, as a *Graine*, *Inch*, *Foot*, *Pearch*, *Pole*, and ſuch like Some of theſe howſoeuer ſometime vſefull in *Topographie*, can haue little or no vſe at all in the vaſt greatneſſe of the whole Earth. Wherefore the *Geographer* ſeldome deſcends ſo low, but takes notice of greater meaſures, ſuch as are *Miles* & *Furlongs*: where we may obſerue by the way, that the vſuall meaſuring amongſt the *Grecians* was by *Stadia* or furlongs, amongſt many of the Latines by *miles*: vnder which we alſo cōprehend *Leagues*: theſe miles are diuerſly varied, according to the diuerſity of Countries, ſo that in ſome places they are eſteemed longer, in other ſhorter: which differences may be learned out of this enſuing Table.

The inſtruments of meaſuring the Earth are
- 1 Furlong containing 125 Geometicall paces or 625 feet.
- 2 Mile which is either
  - 1 Proper containing 8 Furlongs or 1000 paces.
  - 2 Improper, which is either
    - 1 League, which is either
      - 1 Old, containing 12 Furlongs.
      - 2 Newer containing 16 Furlongs.
      - 3 Common of 24 Furlongs.
    - 2 German mile which is either the
      - 1 Common, which is 32 Furlongs or foure Italian miles.
      - 2 Greateſt, containing 5000 paces which is called the *Sueuian*, or *Heluetian* mile.

Howſoeuer this Diſtinction of miles may be many wayes profitable eſpecially in the Topographicall part, yet ſhall wee ſeldome make vſe of any other then the common *Germane* mile, or the common *Italian* mile: To which as the moſt knowne, the reſt may eaſily be reduced.

3 The obiect here propoſed to bee meaſured is the Spheare of the Earth. The Dimenſions according to which it is meaſured, are either *Simple* or *Compound.*

4 The ſimple is twofold, either the *Perimeter*, or the *Diameter*. The *Perimeter* otherwiſe called the circumference, is a great circle meaſuring the Earth round about.

5 The *Inuention* of the *Perimeter* of the Earth depends on theſe following Propoſitions.

1 *If two or more circles bee drawne about the ſame Center, and from the Center to the Circumference be drawne two right lines; The Arches of all the Circles comprehended within the ſaid right lines will bee like and proportionall one to the other.*

This Propoſition being meerely Geometricall, is taken here as a ground without farther demonſtration: whereof if any man doubt, hee may haue recourſe to *Clauius* Commentaries vpon *Iohannes de Sacroboſco*. This principle granted will beget theſe two Conſectaries.

1 *As one degree is to the number of correſpondent miles, or furlongs, ſo all degrees of the circles to the number of miles or Furlongs meaſuring the quantity of the Perimeter of the Earth.*

2 *Wherefore one degree or portion of the Cir-*

cle being knowne by his number of miles or furlongs, the whole Circumference may be found out.

The reaſon of this conſequence euery *Arithmetician* can eaſily ſhew out of the *Golden Rule*: The chiefe point then of the inuention conſiſts in finding out the proportion of any proportion, as a degree, halfe degree, or the like, to the number of miles or Furlongs anſwerable thereunto; for which purpoſe many skilfull *Mathematicians* haue inuented many excellent wayes of great vſe and delight.

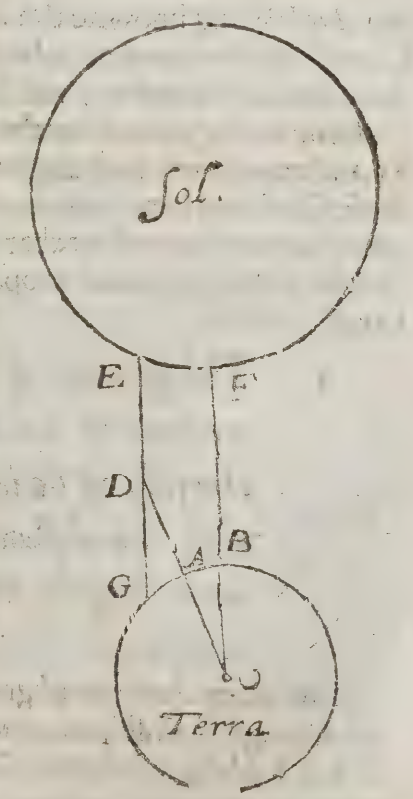
1 *By the eleuation of the Pole, or obſeruation of an Eclipſe, or ſome knowne Starre, the circuit of the Earth may be found out.*

By the Eleuation of the Pole it is performed after this manner: let there be obſerued two *Cities*, or other notable *Land-marks* placed iuſt North and South vnder the ſame Meridian. In theſe two Citties, or markes, let the Eleuation of the Pole be exactly noted. Then ſubſtract the Eleuation of the Southerne Cittie which is leſſer, out of the Northerne, which is greater: the reſidue containes the diſtance of theſe places in degrees; which being experimentally knowne by Miles, Halfe-miles, Furlongs or ſuch like meaſures, will ſhew the true proportion betwixt a degree, and his number of miles: which being againe multiplied by 360, will ſhew the whole circumference of the Earth. For example ſake, wee will take two famous Cities of *England*, *Oxford* and *Yorke*; which are ſituated, if not exactly, yet very neere the ſame Meridian. The eleuation of the Pole here with vs at *Oxford* is 51 degrees and 30 minutes; at *Yorke* it is 54 degrees 30 minutes, or neere there about: ſubtract the leſſer from the greater, the diſtance betwixt *Oxford* and *Yorke* will bee three degrees; which diſtance experimentally knowne in miles, will ſhew the proportion: which wee ſhall finde to bee, (abating ſomewhat in regard of the crookedneſſe of the way) about 180′, anſwering to three degrees of the Meridian:

wherefore to one degree will anſwer 60 Miles, which being multiplied by 360, the whole circle will produce 21600, the meaſure of the whole Earth. The like may bee performed by an Eclipſe in two Citties lying vnder the Equinoctiall circle: two land-markes being once noted out, lying vnder the Equinoctiall, let there bee obſerued in both the ſame Eclipſe of the Moone, eſpecially in the beginning: Now it being certainely found out how many houres the Eclipſe beganne in the one place before the other, wee muſt reſolue their houres into degrees, which is eaſily done: for as much as to euery houre anſweres 15 degrees in the Sunne Diurnall motion, according to Aſtronomers. Now the diſtance betweene theſe two Citties or markes (being ſuppoſed firſt experimentally to be knowne, will eaſily ſhew the correſpondency betwixt the Degrees and miles, which is here ſought. Another way is taught by *Poſſidonius*, as eaſie as the former, which is performed by ſome noted fixt Starre, as *Oculus Tauri*, *Arcturus*, *Spica Virginis*, or any other; let there bee obſerued vnder the ſame Meridian in the Earth two places, whoſe diſtance is experimentally knowne: in both theſe places let the Meridian altitude of the Starre be fully and perfectly obſerued: The difference of theſe two Altitudes will bee the number of degrees betwixt theſe two places: whence we may obſerue how many miles, or other parts anſwer to the number of theſe degrees betwixt theſe two places. This way by *Clauius* is preferred before the former; for as much as it requires not in any place the knowledge of the Eleuation of the Pole, which in any place cannot be certainely knowne, without long and diligent ſearch, and obſeruation: As for Geographicall Tables, they are not alwayes at all times to be had, at leaſt worthy credit.

2 *By the obſeruation of the Noone-ſhadowes the meaſure of the Earth may be found out.*

This way was inuented by *Eratoſthenes* a famous Mathematician: who by obſeruation of the Noone-ſhadowes, obſerued at the ſame time at two diuerſe places, ſituate vnder the ſame *Meridian*, found out the circumference of the Earth. The plaees which he choſe for this purpoſe were *Siene* , and *Alexandria*, ſituated vnder the ſame Meridian : the one inclining to the South, the other to the North. The Diſtance betwixt theſe two places is ſuppoſed to be knowne , whence hee proceeded in this manner : Firſt he erected a *Gnomon* at right Angles on the plaine of the Horizon : when the Sunne was in the beginning of *Cancer* called the *Solſtice*, from which he imagined two *Rayes* or *Beames* to be caſt at Noone : the one paſſing by *Siene* the moſt Southerne part , the other by *Alexandria* the moſt Northerne : ſo that at *Siene*, the Sun being then in the *Solſtice* paſſed into the *Center* of the world ; the place being ſuppoſed to haue beene ſituate vnder the *Tropicke:* The other paſſed by the *Vertex* of the ſaid *Gnomon:* whence by proportion of the ſhadow to the *Gnomon* by a *Geometricall* kinde of working he found out the ſpace betweene *Alexandria*, and *Siene* : which demonſtration, for more euidence wee will here ſet downe : Let there bee in the Earth deſcribed a circle paſſing by *Alexandria* and *Siene* ; in which let A bee the place where *Alexandria* ſtands : B the place of *Siene* : the *Gnomon* or Style erected at *Alexandria* , A D , The Sun-beame carried to the Center of the world at *Siena* F B C, The Sunne-beame paſſing by the *Vertex* , or toppe of the *Gnomon* ſeated at *Alexandria* E D G , caſting his ſhadow A G toward the North : let the *Gnomon* be conceaued to bee prolonged vnto the Center C : Now for as much as in the *Triangle* A D G, the Arch A G ; without any ſenſible difference may bee taken for a Right line, hauing an inſen-



ſible magnitude in regard of the whole Earth: and the Angle A is a right angle, and the two ſides A D, and A G knowne: the former by ſuppoſition, being a *Gnomon* taken at our pleaſure; the latter by any meaſure, or at leaſt by the knowne proportion of the ſhadow to the *Gnomon*, according to the Doctrine of Triangles: the Angle A D G will bee knowne; For whereas the ſides A D, and A G are ſuppoſed to be knowne, their Quadrants alſo will be knowne, which being equall to the ſquare made of D G, by the 47 propoſition of the 1 of *Euclide*, the right ſide D G will eaſily be knowne: out of theſe grounds by the doctrine of the *Sines* and *Tangents* is eaſily found out the Angle A D G, and by conſequence the alternate Angle A C B, which by the 27 of the firſt of *Euclide* is equall vnto it: for as much as the two *Radii* F B C and F D G may be ſuppoſed to bee Parallels in ſo ſmall a diſtance as *Alexandria* & *Siene* compared with the *Sun*: the *Angle* being knowne the *Arch* A B ſubtended to the Angle C, will alſo be knowne, which is the ſpace intercepted betwixt *Siene* and *Alexandria*; and for example ſake: if *Eratoſthenes* (as ſome write) found out the Arch A B, to containe in degrees 85, and experience had taught the length of the Iourney betwixt theſe Citties to haue contained 6183 ½ Furlongs: It would appeare by the *Golden Rule* that 360 degrees containing the whole circuit of the Earth muſt proportionally anſwer to 252000 Furlongs.

1 *The opinions of Coſmographers concerning the meaſure of the Earth, are diuerſe: which is chiefely to be imputed to their errour in obſeruing the diſtances of places experimentally according to Miles, Furlongs, or ſuch like meaſures.*

How many Authors of great name and eſtimation haue differed amongſt themſelues, euery man may enforme himſelfe out of this Table here inſerted. Theſe differences wee finde diuerſly related: but of all others, which Authors haue ſet forth,

	Authors	Furlongs	Miles.
The circuit of the whole earth containes according to	Strabo and Hipparchus	252000	31500
	Eratoſthenes.	250000	31250
	Poſſidonius & the anciẽt Arabians	240000	30000
	Ptolomie.	180000	22500
	The later Arabians	204000	25500
	Italians and Germans.	172800	21600

I preferre the iudgements of Mr *Robert Hues*; For as much as it is not grounded on common tradition, but induſtriouſly by himſelfe deriued out of the Ancients by diligent ſearch and examination, as by one, whoſe iudgement being armed as well with skill in the language, as the knowledge of antiquity, ſcornes to be iniured by tranſlation. What ſhould bee the cauſe of theſe differences, is a matter which hath ſtaggered curious ſearchers into Antiquities more then the former. Euery opinion being ſupported with the names and authorities of ſuch renowned Authors, might challenge a pitch aboue the meaſure of my Deciſion: only I may not bee thought ouer preſumptucus to coniecture where I cannot define, eſpecially hauing ſo good a guide as my forenamed Author, to tread out the way before mee. Wherefore ſuppoſing as a ground, theſe Authors ſo much differing about the meaſure of the earth, to haue beene in ſome ſort led by reaſon. The differences muſt needs ariſe out of one of theſe cauſes: either the errour or negligence of the obſeruers, in truſting too much to others relations without any further ſearch, or elſe the defect in the Mathematicall grounds out of which they deriued their demonſtration; or the diuerſity of meaſures vſed in this worke: or finally, from the miſapplication of theſe meaſures to the diſtances; whence may ariſe ſome errour out of the experimentall meaſuring of places in the earth. In the firſt place it may perhaps be doubted whether *Ariſtotle* defining the meaſure of the Earth to bee 400000 furlongs, were not deceiued by relations: for as much as hee auoucheth it, from the Mathematicians of his times, whoſe authority and credit for ought wee know, deſerues as well to bee forgotten as their names. But this anſwer might ſeeme too ſharp in the other: for as much as wee find them regiſtred for Maſters in their ſcience, and ſuch as could not eaſily bee coſened by others impoſtures. Neither can wee imagine the ſecond to bee any cauſe of their errour for the ſame reaſon: becauſe the wayes theſe Mathematicians vſed in finding out the circuit of the earth, are by writers of good credit commended to poſterity, as warrantably grounded on certaine demonſtrations, being no other then what wee haue ſhewed before, which admit of no Paralogiſme: In the third place wee ought to examin whether the diuerſity of opinion concerning this matter proceeded from diuerſity of the meaſures which were vſed in this worke. *Nonius* and *Peucerus* would needs perſwade, that the Furlongs whereby they meaſured the earth were not the ſame: *Maurolycus* and *Xilander* talke of diuerſe kindes of paces: *Maurolycus* labours to reconcile both, but without effect. Firſt whereas they would haue diuerſe kinde of paces, it cannot be denied: but in the meane time we cannot learne that the *Grecians* euer meaſured their *Furlongs* by *Paces*, but either by *Feet*, or *Fathomes*. A Faddome which the *Greeks* call ὀργυιὰ is the meaſure of the extenſion of the hands together with the breaſt betwixt,containing ſix feet : which is a kinde of meaſuring well knowne vnto our Mariners, in ſounding the depth of the Sea. This meaſure notwithſtanding is by many tranſlated a Pace : by what reaſon, let any man iudge. *Xilander* in tranſlating *Strabo* renders it an Ell : Secondly for a Furlong it containes according to *Herodotus* an ancient *Grecian* writer 600 Feet : which is alſo teſtified by *Suidas*, being much later. A Furlong containes 100 Faddomes; euery Faddome foure Cubits. A Cubit, according to *Heron*, a Foot and halfe, or 24 Digits. Now for the variety of Furlongs,it is true that *Cenſorinus* makes three kindes. For either it is called the *Jtalian* conſiſting of 625 Feet, which is of moſt regard in meaſuring the Earth ; or the *Olympian* of 600 Feet : or the *Pythian* containing 1000 Feet. But to let paſſe this latter, we ſhall finde by ſerious conſideration, that the *Italian* and *Olympian* Furlongs differ only in name, and are indeed the ſame. For the *Jtalian* containing 625 *Roman* Feet (according to *Pliny* in his ſecond booke) is equall to the *Olympian*, hauing 600 *Grecian* Feet. For a Foot with the *Grecians* exceeds the *Roman* Foot by a twenty fourth part : as much as is the difference betwixt 600 and 625. Hence wee ſee how little certainty can bee expected of ſuch as goe about to reconcile theſe opinions out of the various vſe and acception of the meaſures. The moſt probable aſſertion then is, that the errour was grounded on this, that the diſtances of places, mentioned by the foreſaid Authors, were not by themſelues exactly meaſured, but taken vp vpon truſt on the relation of trauellers, wherein they might eaſily bee miſtaken. For inſtance wee will take *Eratoſthenes* and *Poſſidonius*, as of greateſt credit, who are notwithſtanding taxed for many errours in their experimentall obſeruations : whereas it is cleere that *Ptolomy* grounded his opinion on the diſtances of the places, exactly meaſured, as is witneſſed by his deſignation of the Latitude of the earth ſo farre as it was diſcouered and knowne. *Eratoſthenes*, for miſtaking in the meaſure of diſtances,is much taxed by *Hyparchus*,as we find in *Strabo* : For betwixt *Alexandria* and *Carthage*, hee reckons aboue 13 thouſand furlongs, whereas by a more diligent enquiry there are found to bee but 9 thouſand. Likewiſe *Poſſidonius* is knowne to bee miſtaken, in that hee made the Diſtance betwixt *Rhodes* and *Alexandria* to bee 5000 Furlongs, whereas out of the relation of Marriners, ſome haue made it 4000, ſome 5000, as it is witneſſed by *Eratoſthenes* in *Strabo*; who notwithſtanding, ſayes that hee found by Inſtruments that it was not aboue 3750, and *Strabo* would haue it ſomewhat leſſe, as 2640. *Maurolycus*, going about to defend *Poſſidonius* againſt *Ptolomy*, brings nothing but friuolous reaſons vnworthy ſo good an author. Out of all which hath beene ſpoken our former Corollary will bee manifeſt, that the diuerſity of opinions concerning the circumference of the Earth, aroſe from the experimentall miſtake in the diſtances of places, where they truſted to other mens relations, rather then their owne knowledge.

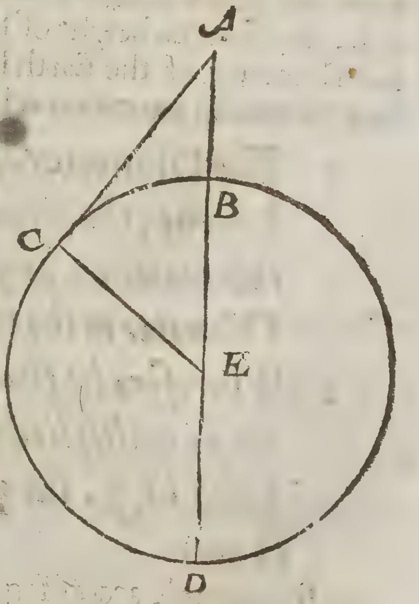
6 The *Diameter* is a right line paſſing by the Center of the Earth from one ſide to the other, and meaſuring the thickneſſe of it: the inuention of which depends on theſe Rules.

1 *As 22 is to 7 ſo is the circumference of a circle to the Diameter: wherefore the circumference of the Earth multiplied by 7, and diuided by 22 will produce the Diameter.*

The exact proportion betwixt the *Circumferences* of a circle; & the *Diameter* being the ground of the *Quadrature* of a circle, is a matter which hath ſet a work the greateſt wits of the world: hauing notwithſtanding as yet by no man been brought to diſcouery, in ſo much as *Pitiſcus*, and other good Mathematicians, might well doubt whether euer it would come to light. Neuertheleſſe, where exactneſſe cannot bee found, wee muſt come as neere as we can. The neereſt proportion in numbers which any could yet light on, is as 22 to 7, which in ſo great and maſſie a body, as the Earth may paſſe without any ſenſible or explicable errour. Suppoſing then out of our precedent Suppoſitions the whole circuit of the earth to bee 21600 *Italian*-miles (which is the common opinion now receaued) I multiply according to the golden Rule 21600 by 7, whence will ariſe 151200, which being diuided by 22 the Quotient will render $6872\,{}^{1}_{8}{}^{1}$ which is the Diameter or thickneſſe of the Earth: ſome leſſe curious are content to take only the third part of the circumference for the Diameter, which will be 7200, which account is leſſe exact, yet ſufficient for an ordinary Coſmographer: for as much as 328 miles, which is the difference, is of no great moment in the meaſure of the whole Earth.

2 *By the knowne height of ſome mountaine without the knowledge of the circumference of the Earth, the Diameter may be found out.*

This is a way inuented by *Maurolycus*, which proceeds in a contrary manner to the former: becauſe the former by the circumference firſt ſuppoſed to be known, ſhewes vs a way to find out a Diameter: but this, firſt ſeeks out the Diameter, by which wee may finde out the circumference: the practiſe is in this manner. Let the circuit of the Earth be conceaued to be B C D (as we ſee in this Figure) in which let there be choſen an high Mountain whoſe Altitude A B may bee knowne by the rules of meaſuring altitudes: then from the Mountaines top A, by the rules of meaſuring longitudes muſt the whole ſpace of Sea or Land bee meaſured ſo far as it can be ſeene: ſo that the viſuall Beame A C, may touch the Superficies of the Earth in C: let the ſpace thē which is ſeene in the Earth be B C, which although in it ſelfe it bee crooked and not plaine, yet can it not ſenſibly differ from a Plaine, for as much as the Arch B C, is ex-



traordinarily little, if compared with the whole Earth. Theſe grounds thus laid, we muſt proceed by a Geometricall manner of argumentation in this ſort. Here are to bee obſerued foure right lines: whereof the firſt is A B, the heigth of the mountaine obſerued: the ſecond is the viſuall Ray A C: the third A D conſiſting of the height of the mountaine, and the Diameter of the Earth. The fourth B C, the diſtance which is ſeene: for (as wee haue ſhewed) it may without ſenſible errour bee taken for a right line. Now for as much as A B, B C are knowne, their Quadrates by the 47 propoſition of the firſt of *Euclide*, will alſo bee knowne, which being equall to the ſquare of A C, the ſquare of the right line A C will likewiſe bee knowne. But the ſquare of the right line A C, ſith it toucheth the circle, will be equall to a Right Angle Figure contained vnder D A, A B, wherefore the right angle ſo conceaued will be knowne. But AB is the knowne heigth of the mountaine, wherefore the right line A D will eaſily be knowne; if wee diuide the knowne right Angle contained vnder A B, A D: by the right line A B: for the Quotient will giue the right line A D; from which if wee ſubduct A B, the knowne height of the mountaine: then will remaine the Diameter of the Earth B D, which was here to be performed: from this inuention will ariſe this Corollary.

1 *The Diameter of the Earth firſt ſuppoſed to be knowne, the circumference may be found out in this manner: as 7 is in proportion to 22, ſo is the Diameter to the Circumference.*

2 *Wherefore let the knowne number of the Diameter be multiplied by 22, and the Product be diuided by 7, the quotient will giue the Circumference.*

As for example according to our former inſtance: Let vs ſuppoſe the Diameter of the Earth to bee $6872\frac{8}{11}$ this number being multiplied by 22, will produce 15120, which product diuided by 7, wee ſhall finde in the Quotient 21600, which is the circumference of the Earth.

7 The compound dimenſions, according to which the Spheare of the Earth is propoſed to bee meaſured, are either the *Superficies* or the *Solidity*.

8 The Superficies is againe twofold, either *Plaine* or *Conuexe*: the Plaine is the ſpace included in the Perimeter.

9 The plaine Superficies may be found out two wayes: either by the *Circumference*, or the *Diameter*: both which wayes taught in theſe Rules.

1 *If the whole circumference bee multiplied in it ſelfe, and the product bee diuided by* $12\frac{4}{7}$ *the quotient will ſhew the* Superficies *included in the circle.*

As in the former example wee will take the Circumference of the Earth to be 21600 *Italian*-miles: let this number be multiplied in it ſelfe, and the product thereof diuided by $12\frac{4}{7}$, the Quotient will amount vnto 9278180, which is the plaine ſuperficies of the Earth.

2 *If the* Semi-Diameter *of a circle be multiplied by the halfe part of the* Circumference: *there will ariſe the meaſure of the* Plaine Superficies *contained in the Circumference.*

The reaſon hereof is ſhewed by *Clauius* in his Tract *de Iſoperimetris Propoſit.* 4. where is demonſtrated, that a Right Angle figure comprehended of the *Semi-Diameter* of any circle, and the halfe of the Circumference will be equall to the Circle it ſelfe, of whoſe parts it is comprehended.

10 So much concerning the *Plaine* Superficies: the knowledge and inuention of the *Conuexe*, may bee performed two wayes: either by the *Diameter* and *Circumference*, or elſe by the *Space* contained within the Circumference, according to theſe Propoſitions.

1 *If the Circumference and Diameter be multiplied the one into the other, the product will ſhew the number of ſquare miles in the face of the Terreſtriall Globe.*

As for example, let the Diameter of the Earth containing according to the common account 80111 $\frac{9}{12}$ furlongs, bee multiplied by the whole circumference, which is 252000, there will ariſe the Conuexe Superficies of the whole earthly Spheare which is 20205818181 $\frac{9}{11}$.

2 *If the ſpace contained in the greateſt circle in the Spheare bee multiplied by 4, there will bee produced the whole conuexe Superficies of the Spheare.*

How to finde out the ſpace or plaine Superficies, is a matter taught before: which being once found is eaſily multiplied by 4, and ſo will giue vs the number ſought.

11 The laſt and greateſt compound Dimenſion, according to which the Earth is meaſured, is the *Solidity*, conſiſting of *Length*, *Bredth*,

Bredth, and *Height*, or *Thickneſſe*: This may bee found out two wayes either by the *Diameter*, and *Conuexe Superficies*, firſt ſuppoſed to be known: or by the knowledge of a great circle without ſuppoſing the Supperficies to be firſt knowne: both wayes ſhall bee expreſſed in theſe Propoſitions.

1 *If the Semidiameter of the Spheare be multiplied into the third part of the Conuex Superficies of the ſaid Spheare, there will ariſe the whole* Solidity *of the Earth.*

This is demonſtrated by *Geometricians*: For a ſolide Rectangle comprehẽded of the Semidiameter of the Spheare, and the third part of the Cõuex Superficies of it, will be equall to the Spheare it ſelfe. As for example, if the Semidiameter of the earth containing 40090$\frac{10}{11}$ Furlongs bee multiplied by the third part of the Conuex Superficies containing, to wit, 67352727$\frac{3}{11}$ there will ariſe the ſolidity of the earth, which will containe 270023206611570$\frac{3}{\text{[illegible]}}$ Cubicke Furlongs. That is the ſolidity of the earth will comprehend ſo many Cubes, cantaining euery ſide ſo many Furlongs, as there are vnities in the ſaid number: For the *Area* or ſpaces comprehended of Solide figures are meaſured by the Cubes of thoſe lines, by whoſe ſquares the Conuexe Superficies of thoſe lines are meaſured.

2 *If the greateſt circle bee multiplied by* $\frac{2}{3}$ *of the whole Diameter: the product will ſhew the ſolidity of the Spheare.*

This way is alſo demonſtrated by *Clauius* in the ſame tract of meaſuring Magnitudes. It may Arithmetically bee deduced in this ſort. If any Spheare whatſoeuer hath a Diameter of 14 Palmes, and ſhould bee multiplied by 3$\frac{1}{7}$, the circumference of the greateſt circle containing it will be found to be 44; whoſe halfe being 22, if it be multiplied into the Semidiameter 7, there will ariſe the Superficies of the greateſt circle 154, which number if wee multiply by two third parts of the Diameter: that is by $9\frac{1}{3}$ there will bee produced the ſolidity of the ſaid Spheare, to wit, conſiſting of $1437\frac{2}{3}$ Cubicke palmes. In the like ſort may wee worke by miles or furlongs in meaſuring the whole terreſtriall Globe, which is a more conuenient meaſure for the maſſie Globe of the Earth.

CHAP. IX.

Of the Zones, Climates, and Parallels.

1 OF the Meaſure of the Earth we haue treated in our former Chapter. In the next place wee muſt ſpeake of the Diſtinction of the Terreſtriall Spheare, which is either in regard of *Spaces* or *Diſtances.*

2 Spaces are portions in the Spheare bounded by the Parallell circles: ſuch as are the *Zones*, *Climats*, and *Parallels.*

3 Theſe are againe conſidered two wayes; either in themſelues, or elſe in their Adiuncts or Inhabitants belonging to them.

4 A *Zone* is a ſpace included betwixt two

leſſer and named circles; or elſe betwixt a leſſer circle and the Pole of the world.

The ſpaces into which the Terreſtriall Spheare is diuided, are either Greater or Leſſer. The Greater is a Hemiſpheare which ariſeth out of one only circle by it ſelfe, without the Combination of more. Such are chiefly of three ſorts. The firſt is made by the Equatour: which diuides the whole Globe into the north and the South Hemiſpheare. The ſecond is of the Meridian, whoſe office it is to part the Earth into the Eaſterne and Weſterne Hemiſpheares: The third of the Horizon, which diuides the Spheare into the vpper and lower halfes: But theſe parts ariſing (as I ſaid) out of one only circle, are handled before with the circles themſelues. In this place wee are to ſpeake of ſuch parts, as ariſe out of the Combination and reſpect of circles one with another. Such as are the Zones, Climats, and Parallels. A Zone ſignifies as much as a girdle or band: becauſe by it the ſpaces in the Earth are (as it were) with larger bands compaſſed about. The *Grecians* haue ſometimes giuen this name Zone to the Orbs of the Planets, as *Theon, Alexandrinus* in his Comment on *Aratus*, in theſe words, Ἔχει γὰρ ὁ οὐρανὸς ζ ζώνας οὐκ ἐπιψαύουσας τοῦ Ζοδιακῶ ἄν, τὴν μὲν πρώτην ἔχει ὁ Κρόνος: τὴν δὲ δευτέραν ὁ Ζεύς. *There are* (ſaith he) *in the Heauens ſeauen Zones not conterminate with the Zodiacke, whereof the firſt is poſſeſſed by Saturne, the ſecond by Jupiter, &c.* But this acception of the name is far off from our purpoſe. The name, Zone, as it is with vs in vſe, is by the Latine Poëts rendred ſometimes *Facia*, ſometimes *Plaga*: both ſignifying one and the ſelfe-ſame thing: which is as much as a ſpace comprehended within two *Named* and leſſer Parallels: or at leaſt betwixt ſuch a Parallell and the Pole it ſelfe: becauſe, as wee ſhall ſhew hereafter Zones are of two ſorts: Theſe Zones are in number fiue; which diuiſion hath beene familiar with our Latine Poëts, as may appeare by theſe verſes of *Virgil.*

Quinq; tenent cœlum Zonæ, quarum vna corusco
Semper Sole rubens, & torrida ſemper ab Jgne:
Quam circum extremæ dextrâ læuâq; trahuntur:

Cæruleâ glacie concretæ, atq́; imbribus atris.
Has inter, Mediamq́;, duæ Mortalibus ægris
Munere conceſſæ Diuûm, &c.

Fiue Zones ingirt the Skies; whereof one fries
With fiery Sun-beames, and all ſcorched lies.
'Bout which the fartheſt off on either hand,
The blew-eyed Ice and brackiſh ſhowres command.
'Twixt theſe two and the midſt the Gods doe giue
A wholſome place for wretched man to liue.

Which deſcription of *Virgil* little differs from that wee finde in *Ouid*, in theſe Verſes.

-----Duæ dextrâ cœlum totidemq́; ſiniſtrâ
Parte ſecant Zonæ : quinta eſt ardentior illis :
Sic onus incluſum numero diſtinxit eodem
Cura Dei, totidemq́; Plagæ tellure premuntur.
Quarum quæ Media eſt non eſt habitabilis æſtu :
Nix tegit, alta duas : totidem inter vtramq́; locauit.
Temperiemq́; dedit miſta cum Frigore Flamma.

Two Girdles on the right hand, on the left
As many cut the Skies: more hot's the fift.
So God diuiding with an equall hand,
Into ſo many parcels cuts the land.
The midſt through heat affords no dwellers Eaſe:
The deepe ſnow wraps vp two: but betwixt theſe
And the other Regions, are two places ſet,
Where froſts are mixt with fires, and cold with heat.

But becauſe this enumeration and deſcription of the Zones ſet downe by the Poëts, ſeemes too popular and generall, wee will more ſpecially diuide them according to the methode of our times in this manner.

5 The Zones are either *Vntemperate*, or *Temperate*: the Vntemperate are againe twofold either cold or hot.

6 The Intemperate hot *Zone* is the ſpace con-

tained betwixt the two *Tropicke* circles of *Cancer* and *Capricorne.*

How vnaptly theſe names of *Temperate* & *Vntemperate* agree to the Zones, conſidered in their owne nature, wee ſhall ſpeake in our ſecond part: yet becauſe I thought it vnfit to vſe other tearmes then the Ancients, I will not coine new names. This Zone, or ſpace included betwixt the two Tropicks, circumſcribes within it two great circles, whereof the one is the Equatour running iuſt in the midſt, neither inclining to the North or South: The other is the *Eclipticke* obliquely croſſing it and meeting the two Tropicks twice in a yeere, in the *Spring* and *Autumne*. The extent or breadth of this Zone then is equall to the diſtance betwixt theſe two Tropicks, to wit, 47 degrees, which make 2820 miles: becauſe from the Equatour to either *Tropicke* we account 23 degrees, which added and reſolued into miles, will make the ſaid ſumme: within the compaſſe of this Zone is ſituate the greateſt part of *Africke*, eſpecially that of the *Abyſſines* (which common opinion with little probability, would haue to bee the Empire of *Preſter Iohn*) alſo many Ilands as *Iaua*, *Summatra*, *Taprobana*, beſides a great part of the South of *America* called *Peruana*: It was imagined by the Ancients, as *Ariſtotle*, *Pliny*, *Ptolomy*, and many other Philoſophers, Poëts, and Diuines, that this Zone through extreame heat was altogether vnhabitable: for which cauſe they called it Intemperate: The reaſon of this coniecture was drawne from the ſituation of this part in regard of that of the heauens. For lying in the middle part of the world, the Sunne muſt of neceſſity caſt his rayes perpendicular, that is to ſay at Right Angles. Now according to the grounds of Peripateticke Philoſophy the Idol of this age, the heat deriued from the Sunne, ariſeth from the reflexion of the Sunne-beames againſt the ſurface of the Earth. Wherefore the heat was there coniectured to bee greateſt, where the reflexion was found to bee greateſt. But the greateſt reflexion, according to all Mathematicians, muſt be in this *Torrid Zone*, where the Sunne darts forth his Rayes at right Angles, which reflect backe vpon themſelues. Which falſe coniecture was a long time continued by the exuberant deſcriptions of Poëts,and defect of Nauigation: hauing as yet ſcarce paſſed her infancy. But how farre theſe ſurmiſes come ſhort of truth, wee ſhall declare in our ſecond part, to which wee haue reſerued thoſe Phyſicall and Hiſtoricall diſcourſes concerning the qualities and properties of the Earth.

7 The Intemperat cold Zones are thoſe which are included betwixt the Polar circles and the Poles: whereof the one is *Northerne*,contained in the *Articke* circle, the other *Southerne* in the *Antarticke*.

Theſe two Zones are not made out of the combination of two circles,as the former: but by one circle with relation to the Pole. The greatneſſe and extent of this Zone is about 23 degrees and a halfe: which reſolued into *Italian*-miles will produce 1380. The Northerne cold Zone containes in it *Groenland*, *Fineland*, and diuerſe other Northerne Regions, whereof ſome are partly diſcouered, and ſet out in our ordinary Maps,other ſome not yet detected. For the other Zone vnder the Antarticke Pole,it conſiſts of the ſame greatneſſe, as wee know by the conſtitution of the Globe, hauing other ſuch accidents correſpondent as the Northerne, ſo farre forth as they reſpect the Heauens. For other matters,they lye hid in the vaſt Gulph of obſcurity, this port hauing neuer yet(for ought I know)expoſed her ſelfe to the diſcouery of the Chriſtian world. Whether theſe two Zones be without habitation, by reaſon of intemperate cold, as the other hath been thought by reaſon of too much heat, wee ſhall in due place examine.

8 The Temperate Zone is the ſpace contained betwixt the *Tropicke* & the *Polar* circle: whereof the one is Northerne contained betwixt the Tropicke of *Cancer* and the *Articke* circle: the

other Southerne comprehended betwixt the Tropicke of *Capricorne* and the *AntarEticke* circle.

Why theſe Zones are tearmed Temperate, diuerſe reaſons are alleaged. 1 Becauſe the Sun-beames here are caſt obliquely on the ſurface of the earth, and by conſequence cannot produce ſo much heat, as in thoſe places where they are darted perpendicularly, if wee only conſider the conſtitution and ſite of the heauens: For as we ſhall hereafter proue, this may ſometimes be altered by the diſpoſition of ſome particular place. 2 It may be called the Temperate Zone, becauſe it ſeemes mixt of both extreames partaking in ſome meaſure the both qualities of heat and cold: the one from the Torrid, the other from the Frigid Zones. 3 Becauſe in theſe Zones the diſtances betwixt Summer and Winter are very remarkable, hauing a middle difference of time betwixt them, as compounded of both extreames. Theſe temperate Zones included betwixt the Tropicks and the Polar circles are twofold as the circles: The northerne temperate Zone comprehended of the Tropicke of *Cancer* and the *Articke* circle, containes in it the vpper and higher part of *Africke*, ſtretching euen to the mountaine *Atlas*: Moreouer in it is placed all *Europe*, euen to the Northerne Ilands in the *Articke* Zone, and a great part alſo of *Aſia*: the other temperate Zone lying towards the South, is not ſo well knowne being farre diſtant from our habitation: and awaiting as yet the farther induſtry of our *Engliſh* and *Dutch* Nauigators. The bredth of this Zone, as the other containes about 43 degrees which is the diſtance betwixt the Tropicke and the Polar circle, which multiplied by 60, will be reſolued into 2580 Italian-miles.

1 *The Torrid Zone is the greateſt of all: next are the two Temperate Zones: the cold Zones the leaſt of all.*

The Torrid Zone is found to be greateſt as well in regard of longitude as latitude, and is diuided by the Equatour into two halfes: the next are the Temperate; but the two cold Zones howſoeuer equall in Diameter to the Torrid, are notwithſtanding leaſt of all: where is to bee noted that euery Zone is of the ſame latitude from North to South, beginne where we will, becauſe it is contained betwixt two equidiſtant circles: but all injoy not the ſame longitude from Eaſt to Weſt, For the parts of euery Zone by how much neerer they are to the Equatour ſo much greater longitude will they haue: by how much neerer the Poles they are, ſo much the leſſe longitude: for as much as the Parallels towards the Poles grow alwayes leſſer and leſſer. The inuention of the quantity of the Zones before mentioned, may briefly thus bee performed. The latitude of the torrid Zone is ſo much as the diſtance betwixt the Tropickes, which is Aſtronomically grounded on the greateſt declination of the Sunne being doubled: This declination being by *Clauius* and others found to be 23 degrees 30 ſcrup. which being doubled will produce 47: which againe multiplied by 60, and reſolued into miles, will amount to 2820: though the odde ſcruples of many Authors are neglected. The latitude of the cold Zones is alſo drawne from the greateſt declination of the Sunne: For the diſtance of the Pole circles from the Pole it ſelfe is iuſt ſo much as the declination of the Eclipticke from the Equatour, to wit, of 23 degrees 30 ſcrup. to which anſwer according to the former Rule 1420 *Italian*-miles. The inuention of the latitude of the temperate Zones depends from the ſubtraction of the diſtance of the Poles of the Eclipticke, from the Equatour: that is from the greateſt declination of the Sunne being doubled from the whole quadrant: in which ſubduction the reſidue will be 43, to which will anſwer 2580 Italian-miles.

1 *The Zone wherein any place is ſeated may bee knowne either by the Globe or Geographicall Table, or elſe by the Tables of Latitude.*

By the Globe or vniuerſall Mappe wee may know it by the diligent obſeruation of the foure equidiſtant circles. For if wee find it betwixt the two Tropicks, we may without doubt, thinke it to be in the Torrid Zone: If betwixt the Tropicke circle and the Polar, it will be in the Temperate. If betwixt the Polar circle and the Pole it ſelfe, it muſt bee in the cold Zone. By the Tables of Latitude it may be found this way: Seeke the latitude of the places giuen in the Table, which if it bee leſſe then 23 degrees 30 ſcruples, the place is in the Torrid Zone. If preciſely it bee ſo much in the Northerne Hemiſpheare, the place aſſigned is vnder the *Tropicke* of *Cancer*, which is the bound betwixt the *Torrid* and the beginning of the Northerne *Temperate* Zone: But if it be in the Southerne Hemiſpheare, it will be vnder the Tropicke of *Capricorne:* which ends the *Torrid* Zone, and beginnes the South Temperate Zone: Euery place hauing more Latitude then 23 degrees 30 ſcruples, yet leſſe then 66 degrees 30 Minutes, is ſeated in the Temperate Zone, either Northerne or Southerne, as the places are in the Hemiſpheare. If the place be preciſely of 66 Degrees 30 minutes, it will be iuſtly found to be vnder the Polar circle, either *Arcticke* or *Antarcticke*. Finally euery place whoſe Latitude exceeds the number of 66 degrees 30 minutes, is ſeated in the cold Zone either Southerne or Northerne. If it reach iuſt to 90 degrees, it will bee iuſt vnder the Pole it ſelfe.

9 Of the diſtinction of the Terreſtriall Spheare by Zones we haue ſpoken: we muſt in the next place deliuer the Diſtinction of the earth according to Climates.

10 A *Climate* is a ſpace of the Earth contained betwixt two *Parallels* diſtant from the *Equatour* towards either Pole.

Climates are ſo called becauſe of their *Declaration* from *Equatour*; for as much as they are to bee accounted as ſo many ſcales of aſcents to or from the *Equatour*. Some haue defined it from the vſe which is chiefly to diſtinguiſh the longeſt time of the Artificiall day : becauſe at the point of euery climate truely taken, the longeſt day is varied halfe an houre : although this account agree not altogether with *Ptolomie*, and the ancient Geographers before him, as wee ſhall ſhew hereafter. This diſtinction of the Terreſtriall Spheare into *Climates* is ſomewhat a more ſubtile diſtinction then the former by Zones; for as much as that is made by the combination of ſuch Parallels as are principally named and of chiefe note, as the Tropicks and Polar circles. But this indifferently reſpects all without difference. This firſt beginning and meaſure, as well of this as all other meaſures of the earth is the Equatour, for that which is moſt perfect and abſolute in euery kinde ought to be the meaſure of all other. But yet wee muſt vnderſtand, that although wee beginne our account of the Climats from the Equatour; yet the Equatour it ſelfe makes no Climate, but only the Parallels which are thereunto correſpondent. For as it is before ſhewed, vnder the Equatour it ſelfe, the artificiall dayes are all equall in length, containing only twelue houres: wherefore beginning from the Equatour betwixt that and the third Parallell, wee count the firſt climate : from the third to the ſixt, the ſecond Climate : and ſo all the reſt, making the number of the Climates double to the number of the Parallels; ſo that one and the ſelfe ſame Parallell, which is the end, and bound of one Climate is the beginning of the next; whence wee ſee that to the conſtitution of euery Climate three Parallels concurre, whereof two are extreame, comprehending the bredth of the ſaid Climate, and one diuiding it iuſt in the midſt. A Parallell therefore differs from a Climate, as a part from the whole, being one circle correſpondent to the Equatour, whereas a Climate is a ſpace contained in three Parallels. Secondly, as a Parallell is conceaued to adde to the artificiall day one quarter or fourth part of an houre; ſo a Climate makes halfe an houre; ſo that by how much any Climate is diſtant from the Equatour, by ſo many halfe houres the longeſt day of that Climate goes beyond the longeſt day of the place vnder the Equatour. Theſe Climates therefore cannot bee all of one equall quantity; becauſe the Equatour is a greater circle, and compre-

comprehends the greateſt ſpace in the Earth: ſo that it muſt needs follow that theſe Climates neere the Equatour being made by the combination of greater circles are greater then thoſe neerer the Poles. But becauſe all Climates are made by the combination of Parallels; wee are to vnderſtand that there are three ſort of Parallels to bee knowne in *Coſmographie*: The firſt are thoſe which doe diſtinguiſh the latitude of places, taking their beginning from the Equatour; and are in an ordinary Globe of Mappe diſtinguiſhed, ſometimes by 10, ſometimes by 15 degrees. The ſecond kinde of Parallels are thoſe that make the Zones, which are indeed ſome ſpeciall named Parallels, as the Tropicks and the Polar circles: The third ſort are called Artificiall Parallels; becauſe they ſhew the diſtances of artificiall dayes and nights, which are commonly noted in the margent of a Geographicall Mappe, which laſt ſort of Parallels are here chiefly to be vnderſtood.

1 *The Zones and Climates agree in forme but differ in greatneſſe, number and office.*

The Climates are ſo called (as we haue ſaid) becauſe they decline from the Equatour, and are ſpaces of the Earth containing two Parallells, in which the longeſt day is varied by halfe an houre. Theſe agree with the Zones in ſome ſort: for both of them are ſpread by the latitude of the Earth, and by Parallell circles compaſſe it about as ſo many girdles: Neuertheleſſe they differ one from the other. 1. In *Greatneſſe*, becauſe the Zones are greater, the Climates leſſer ſpaces in the Earth. 2. In *Number*, becauſe there are only fiue Zones, but many more climates. 3. In *Office*, vſe and effect, becauſe the Zones are to diſtinguiſh the mutation of the quality of the aire and ſhaddowes according to diuerſe Regions of the Earth: but the Climates are vſed to ſhew the greateſt differences of houres in the day: to ſhew the variation of the riſing and ſetting of the ſtarres, for places vnder the ſame Climate haue the ſame quantity of dayes and nights, the ſame riſing and ſetting of the ſtarres, whereas places ſeated vnder diuerſe climats haue a great variation in the dayes and nights, and a diuerſe riſing and ſetting of

the

the ſtars: for as often as the longeſt or Solſticiall day of one place, differs from the longeſt day of another by the ſpace of halfe an houre, a new Climate is placed: wherefore vnder the Equatour or middle part of the earth the dayes are alwayes equall, to wit, of 12 houres: which beginning from the Equatour, if wee approach towards either Pole, ſo far as the greateſt artificiall day amounts to 12$\frac{1}{2}$, we may aſſure our ſelues that wee are come to the firſt Climate: and ſo forward ſtill the greateſt day of our Climate will by ſo much exceed the greateſt day of the other. As the Climates differ one from the other by halfe houres, ſo the Parallels by quarters, as we haue ſhewed: and ſhall more fully explaine in this Chapter.

2 *The Climates compared one with the other, are not all of the ſame greatneſſe.*

Although the Climates are placed according to equall increaſe of dayes and nights, yet ſuffer they a great inequality: For no clime is equall to another in the ſame Hemiſpheare, but are ſtill greater then other, by how much neerer they are to the Equinoctiall circle; for the latitude of the firſt Climate is reckned to be about 8 degrees, which make 480 *Italian*-miles: but of the laſt not ſo many minutes as quarters of miles.

11 In Terreſtriall Climates, two things are to be vnderſtood; 1 The *Inuention*: 2 The *Diſtinction.* The Inuention teacheth the manner how to find out in what Climate any place lieth. The finding out of any climate depends vpon the obſeruation of the length of the day; for the length of the day being once known, the Climate will alſo bee found out by this Rule.

1 *Double the houres aboue 12, and the Product will ſhew the Climate.*

The reaſon of this rule is intimated before; to wit, that the climates are diſtinguiſhed the one from the other by the ſpace of halfe an houre of the longeſt day: Now the dayes vnder the equatour are alwayes equall, containing 12 houres in length: from which towards the Pole they are increaſed by degrees: wherefore the number of the Climates muſt needs bee double to the number of houres aboue 12: as for example, if I ſhould find out in what Climate *England* is ſituated: I find the length of the longeſt day to be about 18 houres, which is ſix houres more then 12; this I double, and it will be 12; whence I collect, that *England* is ſituated vnder the 12 Climate: A more compendious way of finding out the Climate of any place, is by a certaine Table, wherein againſt euery Eleuation of the Pole is ſet the iuſt Climate: which Table we ſhall inſert hereafter. Here muſt bee noted that this rule which wee haue taught is to bee vnderſtood of the Climates as they are abſolute in nature, and not of *Ptolomies* Climates: If any man would finde out the Climates of *Ptolomie*, hee muſt firſt caſt away three quarters of an houre, which is 45 minutes; becauſe his Climates, as wee ſhall ſhew, beginne not immediatly from the Equatour, but from the latitude of 12 degrees.

12 Thus much for the *Jnuention*: the *Diſtinction* of Climates is *Northerne* and *Southerne* Climates: both theſe againe are of two ſorts, either proper or improper.

13 The proper Climates are thoſe which are placed between the Equatour and the point neere the Polar circle: The improper are thoſe from the Polar circle to the Pole it ſelfe.

Wee muſt vnderſtand that the climates are conſidered two manner of wayes, 1 Abſolutely in reſpect of the whole *Terreſtriall* Spheare. 2 Comparatiuely, in reſpect of the knowne habitable part of the Earth: According to the latter conſideration the ancient Geographers haue otherwiſe diſtinguiſhed the Climates then the new writers: whence ariſeth a great difference and confuſion amongſt them, in defining the number of the climates. For ſometime they will haue a new climat put whenſoeuer the day increaſeth a quarter of an houre: ſometimes at halfe an houre, ſometimes at difference of an whole houre or day. But the doubt is eaſily anſwered, and reconciled by our former diſtinction; for whereas they put the difference of climates to be halfe an houre, it is to be vnderſtood of theſe which are proper climates betwixt the Equatour and the Polar circle, for it is certaine that beyond this circle the artificiall day increaſeth, not only by houres, but by dayes, weeks, months; ſo that another account muſt bee made of ſuch climats then of the former. But it hath been generally taken for thoſe climates of the Ancients: now the diſtinction of climates amongſt the Ancients is of two ſorts. The firſt was of the Geographers before *Ptolomy* who placed the vttermoſt bound Northward in the 25th degree of Latitude or Eleuation, and ſo made only ſeuen climates. Theſe 7 climates were all vnderſtood to bee in the habitable parts wherein they were marked and deſigned out vnto vs by names taken from *Citties*, *Mountaines*, *Regions*, and ſuch like remarkable places, where we are to conceaue that climate as neere as may bee gueſſed to runne through the middle of any ſuch Region, whereof it taketh its name: But the better to vnderſtand the Diſtinction of the climates, as well with the Ancient as Moderne Coſmographers, we will inſert this following Theorem.

1 *In the placing and Number of the Climates and Parallels, there is a great diuerſity betwixt the Ancient and Moderne Geographers.*

This hath been before mentioned: but for better diſtinction we haue reſerued the handling of theſe differences to this propoſition.

poſition, which may ſerue as a Carollary to the reſt. Firſt wee take it as granted that *Ptolomy* ſo appointed the Parallells (out of which the climates muſt ariſe) that he numbred 38 both wayes from the Equatour: to wit, 38 towards the South, and ſo many towards the North. Theſe Parallels he ſo diſtinguiſhed, that 24 he numbred by quarters of houres, foure by halfe houres, foure by whole houres, and ſix by whole months. Hence is it that Geographers ſay, that a new Parallell is to be placed ſometimes whereas the longeſt day increaſeth by a quarter of an houre; ſometimes where it increaſeth by a halfe, ſometimes by a whole houre, ſometimes by a whole moneth. The firſt is to be vnderſtood of thoſe 24 Parallels which were deliuered by the Ancients before *Ptolomy*. The ſecond, third, and fourth of ſuch as were vnknowne vnto thoſe Ancients before *Ptolomy*. To reduce all into order we will ſet downe this diſtinction. The diſtinction of the Climats is either ancient or new. The Ancient was againe twofold: either former or latter. The former was that which was ſet downe before *Ptolomies* time, wherein there were aſſigned ſeuen Climates according to the common opinion (though *Mercator* grants but 5) Theſe Authours placed their Northerne bound in the 25 degrees or eleuation: The later diſtinction was almoſt the ſame, but ſomewhat corrected by *Ptolomy*, who placed 9 Climates towards the North. The firſt paſſed by *Meroe* a Citty of *Ethiopia*, where the longeſt or Solſtitiall day is 13 houres. The ſecond by *Siene* in *Egypt*, where the longeſt day is 13½: The third by *Alexandria* in *Egypt*, where the longeſt day is 14 houres; The 4th by the Iland of *Rhodes*, where the longeſt day is of 14½. The fift by *Rome*, where they haue the length of the longeſt day 15 houres. The ſixt by *Pontus*, where the longeſt day is 15½ houres. The ſeauenth by the mouth of *Boriſthenes* where the longeſt day is of 16 houres. Neuertheleſſe ſome haue drawne the 6 Climate by *Boriſthenes* in *Sarmatia*, and the ſeauenth by the *Riphæan* mountaines. *Ptolomy* to this number addes two more, and ſo reckons them that the 8 ſhould paſſe by the *Riphæan* mountaines, and the 9 by *Denmarke* where the day at longeſt is 17 houres. To theſe Northerne Climats they oppoſed ſo many towards the South, which they called Anticlimates. Theſe as it ſhould ſeeme in *Ptolomies* time were Imaginary altogether, becauſe few or no places were diſcouered at that time beyond the Line. But to leaue *Ptolomy* and his old Authors, and examine the induſtry of later Geographers, wee ſhall finde the Diſtinction of the Climates to bee twofold; either vnperfect wherein they numbred onely 19 Climates; or perfect, wherein they accounted 46 or 48, of which 23 or 24 were Northerne, and the other on the oppoſite part, to wit, in the South. The perfect diſtinction of the Climates is againe (as later writers ſpeake) either certaine or vncertaine. The certaine they call that wherein the Climates are diſtinguiſhed and ranged from the Equatour to the Polar circle: For ſithens the Northerne Regions are now diſcouered beyond 70 degrees of the *Eleuation* of the Pole, and a Climate is defined to bee a ſpace comprehended betwixt three Parallels in the habitable Earth: wherein the length of the longeſt day is increaſed by halfe an houre; Therefore it muſt needs be, that from the Equatour to that habitable part of the Earth, wherein the longeſt day is 24 houres (which is not farre from the Pole-circle) there ſhould be placed 24 Climates. The vncertaine diſtinction they call that which is betwixt the *Polar* circle, and the *Pole* it ſelfe, which may bee tearmed *Improper*; becauſe in theſe Climates the day is not increaſed by halfe houres, as in the former, but firſt by whole *Dayes*, then by *Weekes*, and laſt of all by whole *Moneths*: In ſo much that vnder the Pole it ſelfe they haue 6 Moneths perpetuall day, and ſo long againe a continuall night. The *Parallels* whereof the Climates are made, were ſet downe by *Ptolomie* 38 (as wee haue ſaid) but the later writers haue placed them ſo farre Northernly, that they reach to that tract wherein the Sunne tarries aboue the *Horizon* a whole 24 houres, and ſo haue numbred 23 or 24 towards the *North*, and ſo many towards the *South*. The cauſe of this diuerſity is becauſe ſome draw the firſt by the mouth of the *Redde-Sea*: others by *Meroe*: for the farther conſideration of theſe climates corrected by later Geographers, they beginne their account from the Equatour it ſelfe, which in this caſe is the beſt rule of certainty: becauſe we hold that whole tract of Earth to bee habitable, as we ſhall proue in our ſecond booke.

14 A Parallell is a ſpace wherein the longeſt day is increaſed by a quarter of an houre.

Concerning the *Parallels*, little can be ſaid more then wee haue opened in the doctrine of the Climats: for (as we ſhewed) the one cannot be well vnderſtood without the other: only to auoid ambiguity of ſpeech, wee muſt conſider that a Parallell may bee taken either for a *Line* or *Circle*, in which ſenſe wee tooke it in the fift Chapter; where we diuided them into *Named* or *Nameleſſe*: or elſe for a ſpace bounded by circles as wee here vnderſtand it. The neglect of this diſtinction hath made ſome *Geographers* ſpeake ſometimes improperly. The Parallell is found out by this rule.

1 *Let the number of the longeſt day aboue* 12 *be multiplied by* 4, *and the Product will ſhew the Parallell.*

The reaſon is giuen before in the doctrine of the *Climates*, becauſe the *Parallell* ſpace, according to Latitude, is but halfe the *Climate*: ſo that as in finding out the climate for any place wee ought to double the houres of the longeſt day aboue 12: ſo here wee ought to quadruple them, which is to multiply them by 4: As for example at *Rome* we finde the longeſt day to be about 15, which exceeds 12 by 3; which being againe multiplied by 4, will produce 12, which is the Parallell for the place.

2 *The* Parallels *no where diuide the* Climats *into two equall parts.*

In the climates wee are to conſider two things, either their latitude or bredth from North to South: or their longitude or extent from Eaſt to Weſt. In reſpect of the former wee may hardly without ſenſible errour call the Parallell halfe the Climate, in regard the three lines whereof the climate conſiſts, to wit, the middle and the two extreames, are not alwaies of like diſtance: but if we conſider the extent of the Circumference as it ſtretcheth i ſelfe betwixt Eaſt and Weſt, we muſt needes acknowledge much more: to wit, that of two *Parallels*, diuiding the ſame climate betwixt them, that that is manifeſtly the greateſt which is next the *Equatour*, and that is the leaſt which is neereſt to the *Pole:* becauſe the Circles which comprehend their *Parallell* ſpaces, continually decreaſe towards the *Pole*: ſo that if we imagine two men to trauell round about the earth, the one in a Parallell neerer the Equatour, the other neerer the Pole, in the ſame ſpace of time; it muſt needs follow that he ſhould goe far faſter which is neerer the Equatour then the other neere the Pole: for howſoeuer *Columella* ſeemes to make a Parallell to haue in bredth 60 foot, and to intimate by conſequence an equality of the Parallels amongſt themſelues, yet muſt this bee vnderſtood of Parallels which are neere one to the other neerer the Equatour, which comprehend a great ſpace of land; and admit no ſenſible difference. Other matters which concerne the *Climates* and *Parallells*, ſhall be (God willing) vnfolded in our Tables in the next Chapter, when we haue ſpoken of the *Inhabitants*, and ſuch other adiuncts appertaining: without the which this treatiſe will be vnperfect, depending for a great part on ſuch circumſtances as our method admits not in this place, but immediatly follow.

CHAP. X.

Of the diſtinction of the Inhabitants of the Terreſtriall Spheare.

1 HAuing hitherto treated of the diſtinction of ſpaces bounded by circles in the Terreſtriall Globe, to wit, *Zones*, *Climates*,

and *Parallels*; wee are now to treate of the Inhabitants, as ſuch adiuncts as properly belong to ſuch ſpaces; ſo farre as it concernes the conſtitution of the whole Spheare.

2 The diſtinction of the Inhabitants is twofold, either *Abſolute* or *Comparatiue*: Abſolute as they may be conſidered in themſelues without any compariſon of one with the other.

3 The former is againe twofold: either from the *Poſition* of the Spheare, or the differences of their *Sun-Shadowes*: According to the poſition of the Spheare the Inhabitants may be ſaid to haue either a *Right*, *Oblique*, or *Parallell* Spheare according to their Horizons.

What theſe three Spheares are, may appeare by that which we haue formerly ſpoken concerning the diſtinction of Horizons in the ſixt Chapter of this Treatiſe, and therefore needs no farther repetition: we are in this place to treat of the ſeuerall accidents, and conditions of the Inhabitants. Out of the diſtinction of the threefold Spheare will ariſe 13 manners of habitation: which for more order ſake, wee will reduce into certaine heads in this manner.

4 The people of a right Spheare are ſuch as inioy a right Horizon, whoſe proprieties ſhall be declared in this Theoreme.

1 *The Inhabitants of a Right Spheare in reſpect of the heauens haue the ſame accidents.*

Theſe accidents are chiefly foure, 1 They inioy a perpetuall Equinoctiall, hauing their dayes and nights alwayes equall the one to the other: becauſe the Sunne neuer ſwaruing from his *Eclipticke*, hath his courſe equally diuided by the *Horizon*. 2 With them all the ſtarres equally ſet and riſe; becauſe all the Parallels wherein the ſtarres make their Diurnall Reuolution are equally cut by the Horizon. 3 To them the Sunne is twice in the yeere verticall, that is directly ouer their heads, and twice againe in the yeere Solſtitiall: The former in the firſt degrees of *Aries* and *Libra*, the latter in the firſt degrees of *Cancer* and *Capricorne:* which diuerſe propoſitions of the Sunne, ſome later Geographers haue tearmed foure Solſtices: two higher and two lower. 4 Hence comes it to paſſe that they yeerely enioy two winters, and two Summers: likewiſe two ſprings and two Autumnes. Their Summer when the Sunne is to them verticall: their winter when it is ſeated in either of the Tropicks. Their Springs and Autumnes while the Sunne is paſſing through the middle ſpaces betwixt both.

5 The people inhabiting an *Oblique* Spheare are ſuch whoſe *Horizon* is oblique. The proprieties belonging vnto them are either Generall or Speciall.

6 The Generall are ſuch as agree to all thoſe which inhabit an oblique Spheare.

1 *All the Inhabitants of an oblique Spheare agree in two proprieties.*

Theſe two proprieties wherein they agree are theſe. 1 To all the Inhabitants without the Equatour vnder what Parallell ſoeuer, the dayes are equall to the nights only twice in a yeere, to wit, either in the beginning of the Spring, or the beginning of the Autumne. At other times either the dayes increaſe aboue the nights as in the Summer, or grow leſſer as in the winter. 2 To theſe inhabitants ſome ſtars are perpetually ſeene, as ſuch which are neere the Pole to which they incline: ſome are neuer ſeene, as ſuch as are fartheſt off from the ſaid Pole: ſome riſe and ſet, which are thoſe which are in the middle ſpace betwixt both; which are ſometimes viſible, and ſometime lie hid.

7 The ſpeciall Accidents of an Oblique Horizon, are ſuch as agree to ſpeciall places in the ſame Spheare.

1 *The Inhabitants of an Oblique Spheare of fiue ſorts, inioying ſo many correſpondent properties.*

The firſt ſort are of thoſe, whoſe Zenith is betwixt the *Equator* and one of the *Tropickes*, euen vnto the 23. Degrees, 30. Scruples of eleuation of the Pole: In ſuch a ſort, towards the North betwixt the Line and the Tropicke of *Cancer*, are placed the inhabitants of *Zeilan*, the extreame part of the *Eaſt Indies*, *Hiſpaniola*, *Guinea*, *Nubia*, with ſome part of *Arabia fœlix*, and all other places betwixt the *Equatour* and the Tropicke of *Cancer* in the *Torride* Zone. Towards the South in the ſame Latitude, are placed the *Braſilians*, the *Peruuians*, the *Iauans*, with many others. The Accidents which happen vnto theſe Nations are theſe, 1. They may ſee all the ſtarres except a few which are neere the Pole. 2. Their dayes and nights are ſomewhat vnequall, ſo that their longeſt day, or longeſt night, is not alway of the ſame quantity. 3. Twice in the yeare they haue the Sunne-verticall, but without the *Equatour*. 4. They haue two Summers, and two Winters, but not equally tempered. 5. The length of their longeſt day reacheth to 13.$\frac{1}{2}$ houres.

The ſecond ſort are ſuch as inhabite vnder the *Tropicke* it ſelfe, whoſe eleuation of the Pole is equall to the greateſt declination of the Sunne, which is 23. degrees, 30 Scruples. Vnder the *Tropicke* of *Cancer* is placed a great part of *Arabia fælix*, *Eaſt India*, the Southerne parts of *China*, the higher parts of *Egypt*, and *Siene*. Vnder the Tropicke of *Capricorne* are placed the people of *Monomotapa*, and *Madagaſcar*, with other places: The accidents belonging vnto them are theſe, 1. To them appeare all the ſtarres comprehended in one of the circles, but none of the other. As for example, to thoſe inhabiting the Tropicke of *Cancer*, the ſtarres included within the Articke Circle alwayes appeare, but neuer thoſe which are in the Antarcticke: likewiſe to thoſe which dwell vnder the Tropicke of *Capricorne*, all the ſtarres appeare which are contained within the Antarticke Circle, but none of thoſe included within the Articke Circle. 2. By how much neerer the Sunne approacheth to their Zenith or Verticall point, by ſo much are their dayes lengthened; and by how much farther it goes off, by ſo much are they ſhortned: ſo that they inioy then their longeſt day, when the Sunne directly paſſeth by their Zenith. 3. To them the Sunne is verticall but once in the yeere: to wit, to thoſe vnder the Tropicke of *Cancer*, when the Sunne enters into the ſigne; as to the other when it toucheth the firſt Degree of *Capricorne*. 4. They haue but one Summer and one Winter throughout the yeere.

The third ſort, are ſuch inhabitants as dwell in one of the temperate Zones betwixt the Tropicke and the Polar Circles from 24. Degrees of eleuation, to 66. Degrees, 30. Scruples. Such inhabitants towards the North, are (as wee haue ſhewed) almoſt all the inhabitants of *Europe*, *Aſia maior*, and part of *Africa*: as on the other ſide towards the South, the *Chylienſes*, the farthermoſt *Africans*, and thoſe that dwell neere the ſtraits of *Magellane*. Their properties are chiefly theſe, 1. Many ſtarres are by them alwayes ſeene, and many neuer appeare. 2. Their dayes notably differ in inequality. 3. The Sunne neuer arriues at their Zenith, but is alwayes on the South of thoſe which inhabite betwixt the Tropicke of *Cancer*, and the Articke Circle, and alwayes on the North ſide of ſuch as dwell in the oppoſite temperate Zone. 4. They haue in the yeere but one Summer and Winter, but by reaſon of the diuerſity of places much vnequall: for where the eleuation of the Pole is greater, the winter is much harder; but where it is leſſer it is more temperate.

The fourth kinde of inhabitants, are thoſe which reſide vnder the Polar Circle, (which is their Zenith) where the temperate Zone endes, and the cold beginnes: where the eleuation of the Pole is beyond 66. Degrees 30. Minutes, in which Tract lies *Noua Zembla*, with many other Ilands not yet well diſcouered in the North: and perhaps as many more vnder the Antarticke Circle towards the South, leſſe knowne than the other. The accidents belonging to them are theſe, 1. Thoſe which inhabite vnder the Arcticke Circle, ſee all the ſtarres included within the Tropicke of *Cancer*, but neuer thoſe within the Tropicke of *Capricorne*: Likewiſe, thoſe which liue vnder the Antarcticke Circle, ſee all the ſtarres within the Tropicke of *Capricorne*, but neuer thoſe within the other Tropicke of *Cancer*. 2. Their longeſt day at Midſummer is 24. houres, their night then being but a moment: likewiſe their longeſt night, as at Mid-winter, is but 24. houres, their day paſſing not a moment. 3. The Center of the Sunne euery yeere twice toucheth at their Horizon. 4. The Sunne at Noonetide is alwayes on the South of thoſe which dwell vnder the Arcticke Circle, except it bee in the Summer Tropicke, when it is the Mid-night, or Northerne point: likewiſe to thoſe that are vnder the Antarcticke Circle, the Sunne at noone is alwayes on the North ſide, except vnder the Winter Tropicke. 5. They haue in the yeere one Winter and one Summer: but the Winter farre colder, and the Summer ſlacker then in the forenamed places.

The fift and laſt habitation, is of thoſe which are included betwixt the Polar Circle, and the Pole it ſelfe, from 66. Degrees and 30. minutes of eleuation to 90. In which Tract, little is diſcouered Northward, and in the South climate nothing at all. The ſpeciall Accidents appertaining to them are theſe, 1. With them a few ſtarres are ſeene to ſet and riſe. 2. They haue an *Equinoxe* the Sunne touching the firſt Degree of *Aries* and *Libra.* 3. They of the North Zone haue more dayes about the middle of Summer, and more nights in the Winter: likewiſe, they of the South frozen Zone, the contrary. 4. They haue extreame cold Winters, and in ſtead of Summer, a ſmall remiſſion of cold. 5. The ſignes of the Zodiacke to them prepoſterouſly riſe.

8 The inhabitants of a *Parallell* Spheare are diſcouered in this propoſition.

1 *The inhabitants of a* Parallell *Spheare enioy but one kinde of habitation, in reſpect of the Heauens.*

A *Parallell* Spheare, I here accurately vnderſtand for that poſiture of the Globe, wherein the Pole of the world is preciſely placed in the Zenith, or eleuated to 90. degrees of Altitude: becauſe onely in ſuch a ſite, the Equator and the Horizon agree in one, and lye parallell to all the reſt of the Parallell Circles: which places, whether it bee at all capable of habitation by reaſon of cold, wee ſhall diſcuſſe hereafter in the ſecond part: but out of ſuppoſition admitting a place of habitation, theſe accidents will happen, 1. The fixt ſtars which they ſee, are alwayes ſeene ſo, that with them there is no point of Eaſt or Weſt; for the ſtarres neuer riſe nor ſet. But the Planets riſe and ſet, but not by their diurnall, but proper motion. 2. They haue a continuall day of ſixe moneths, and a night alſo as long, the Sunne riſing continually in the firſt degree of *Aries*, and ſetting in the firſt of *Libra.* 3. The Sunne in the Equinoctiall points, for all the time that hee is aboue the Horizon (as all the other ſtarres) is turned round about in manner of a wheele. 4. The Equatour ſerues in place of the Horizon, and the Equatour is euery where equidiſtant from the Pole 5. They haue one Winter and one Summer, the former exceeding cold, the latter leſſe warme then ours.

9 The ſecond diſtinction of the inhabitants

of the earth is taken from their *Noone-ſhaddowes.*

The Sunne in diuers parts of the earth diuerſly ſpreads his ſhaddow, becauſe the *Gnomons* or *Opacous* bodies by which the ſhadowes are made in the earth, are in diuers places diuerſly oppoſed, or obiected to the Sunne: for whereas the Sunne ſo runs in his *Eclipticke* Circle betwixt the two Poles, that though his paſſage be in an oblique Circle, yet he neuer comes ſo farre as the Poles themſelues: it neceſſarily muſt be, that ſometimes he ſhould ſhoot forth his beames *perpendicularly*, as when it is in the verticall point of a place; ſometimes *Obliquely*, as when he declines either one way or other from the verticall point; ſometimes in *parallell* wiſe, for as much as in ſome places of the earth, the Sun cleauing as it were to the Horizon, caſts out his beames *parallell* and *equidiſtant* to the plaine of the Horizon. The right or perpendicular beames of the Sunne, falling on the ſuperficies of the earth at right Angles, are turned and reflected into themſelues, and ſo make no ſhaddowes at all. But the oblique beames, in that they are not reflected into themſelues, muſt of neceſſity produce ſhaddowes, yet in diuers manners; for thoſe Sunnebeames which obliquely proiect themſelues on the plaine of the earth, ſo as they come not from the Horizon it ſelfe, will make ſuch kinde of ſhaddowes as ſhall proportionally agree with their *Gnomons*, or *Opacous* bodies, and ſuch whoſe magnitude may in a manner be deſigned out, and certainly meaſured by the ſight. But on the contrary part, the beames which are eſteemed *parallell* to the plaine of the Horizon, finding no ſolide obſtacle or let, ſhoot forth infinitely, making no Angles on the ſuperficies of the earth, and can haue no proportion at all with their *Gnomons*, that the ſhaddow may be any way deſigned by our eyes. But here we are to conſider, that the ſhaddowes chiefly to be conſidered, are the *Meridian* or *Noone-ſhaddowes*, which take their diſtinction from the diuers incidency of the beames, which the Sunne caſts forth at noone. According to this manner.

10 The inhabitants of a place in reſpect of the ſhaddowes are either *Amphiſcij*, *Heteroſcij*, or *Periſcij*. The *Amphiſcij* are thoſe, whoſe *Noone-ſhaddowes* (but at diuers times of the yeere) are caſt both wayes; that is to ſay, North and South.

Amphiſcij ſignifies as much as people of a double ſhaddow: ſuch are they which inhabite betwixt the Equatour and the Tropickes, where the eleuation of the Pole equals not 24. degrees: Theſe men haue the Sunne twice euery yeere in their Zenith or verticall point, and then they make no ſhaddowes at all; and therefore they are called *Aſcij*, or without ſhaddowes. But when the Sunne paſſeth from their verticall point towards the Northerne ſignes, then at noone it will caſt the ſhaddow towards the Southerne coaſt: But contrarywiſe, comming from the Zenith toward the Southerne ſignes, the ſhaddow will bee darted toward the North, which is euident out of the *Opticke* principles; becauſe the ſhaddow is alwayes found to be oppoſite in place to the *Sunne-beames*, the *Gnomon*, or darke body interpoſed.

11 The *Heteroſcij* are thoſe, whoſe Noone-ſhaddowes turne only one way, that is, either toward the North, or toward the South.

Theſe Nations inhabite in a temperate Zone, betwixt the Tropicke and the Polar Circles, whereas ſuch as dwell in the temperate toward the North, betwixt the Tropicke of *Cancer* and the Polar Circle *Articke*, haue their noone-ſhaddowes caſt Northward. But thoſe on the other ſide of the Equatour, dwelling betwixt the Tropicke of *Capricorne*, and the *Antarcticke* Circle, caſt their ſhaddowes Southward: Of the former ſort are *Grecians*, *Italians*, *French*, *Spaniards*, *Germans*, *Polonians*, *Suedians*, *Danes*, *Engliſh*, and the reſt inhabiting our temperate Zone: which gaue occaſion of that ſpeech of *Lucan* the Poët, concerning the *Arabians* comming into *Theſſaly*, in the warre of *Hanniball* and *Pompey*;

> *Ignotum vobis* Arabes *veniſtis in orbem*,
> *Vmbras mirati nemorum non ire ſiniſtras.*
>
> Y'are come *Arabians* to an vnknowne land,
> Wondering the ſhades nere take the Southward hand.

Which verſes are in this ſenſe to be vnderſtood; *Poets* are ſaid to looke and turne their faces towards the Weſt, ſo that the South muſt of neceſſity be counted the left ſide: Now the place whereunto the *Arabians* came, being a part of *Theſſaly*, where ſuch dwell who only caſt their ſhaddowes one way, to wit, Northward; but *Arabia* their naturall Countrey, being ſuppoſed to be included in the *Torrid* Zone, where the ſhaddowes were ſaid to be caſt both wayes, they are ſaid to wonder: The reaſon why our ſhaddowes at noone are caſt alwayes toward the North, and the others toward the South, is related before, to be becauſe the ſhaddow doth alwayes occupie or poſſeſſe the place oppoſite to the Sunne, or light body.

12 The *Periſcij* are ſuch inhabitants whoſe ſhaddowes are mooued round about them in a circular forme.

In ſome places of the earth the *Noone-ſhaddowes* take not their beginning from our heads, but of one ſide, and are extended forward to the plaine of the terreſtriall Horizon, and ſo mooued round about the Opacous body, as about a *Gnomon*: whence they are called *Periſcij*; which is as much to ſay, as men hauing ſhaddowes mooued round about; ſuch is their habitation which are included in the *Frigid* Zone, circumſcribed within the Polar circles, and the Poles: Here the Sunne neuer directly paſſeth by the crowne of their heads, but at one ſide: ſo that they haue the Pole for their verticall point, but the Equatour, as it were, for their Horizon. Theſe *Periſcij* are of two ſorts, for ſome are contained in the *Articke* circle, the other in the *Antarcticke*, whereof both are as yet vndiſcouered; eſpecially the *Antarcticke*, being fartheſt off from our climate.

1 *The habitation of the* Amphiſcij *comprehends* 7. *Parallels, of the* Heteroſcij 41. *of the* Periſcij 6. Moneths.

Of the nature and accidents of theſe three ſorts of people there needs no more to be ſpoken, then wee haue deliuered before in this Chapter; Neuertheleſſe, for a recapitulation of our former doctrine in this & the precedent Chapter, it will not be amiſſe to inſert this table of Climates, ſet out by our exacteſt *Geographers*; wherein is expreſſed (as it were) to our view the reſpect and ſeuerall accidents, which belong to theſe ſeuerall inhabitants.

13 Thus much for the Inhabitants abſolutely conſidered: The inhabitants compared one with the other according to their poſition, are the *Periœci*, *Antœci*, and *Antipodes*.

14 The *Periœci* are thoſe inhabitants which dwell in the two oppoſite points of the *Parallell* circle.

15 The *Antœci* are ſuch as dwell vnder the ſame *Meridian*, but in diuers *Parallels* equally diſtant from the *Equatour*.

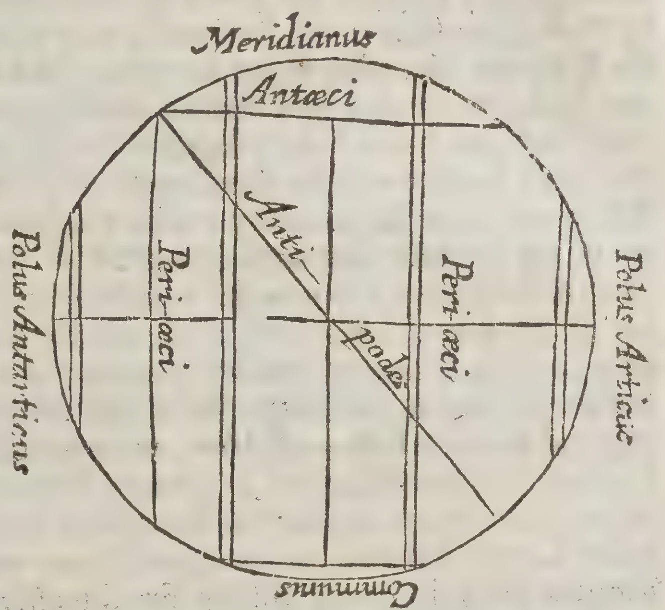
16 The *Antipodes* are ſuch as inhabite vnder one *Meridian*, but vnder two *Parallels* equidiſtant from the *Equatour*, and two oppoſite points of thoſe *Parallels*.

These

ATable of the Climates belonging to the three ſorts of Inhabitants: Pag: 229.

bitants ging to all Cli-	Climes	Parallels	The longeſt ſummer day. Hou. Scr.	Latitude & elevation of Pole. Scr. Degr.	The breadth of the Climats. Deg. Scr	The places by which the Climates paſſe.
A hiſcij	0	0 1	12 0 12 15	0 0 4 18	4 18	The beginning from the Æquatour.
	1	2 3	122 30 1 45	8 34 12 43	8 25	Sinus Arabicus or the Red Sea.
	2	4 5	13 0 13 15	16 43 20 33	7 50	Meroe an Iland of Nilus in Ægypt.
	3	6 7	13 40 13 45	23 10 27 36	7 3	Siene a City in Africa.
	4	8 9	14 0 14 15	30 47 33 45	6 9	Alexandria in Ægypt.
	5	10 11	14 30 14 45	36 30 39 2	5 17	Rhodes and Babylon.
	6	12 13	15 0 15 15	41 22 43 32	4 30	Rome and Helleſpont.
	7	14 15	15 30 15 45	45 29 47 20	3 48	Venice and Millaine.
	8	16 17	16 0 16 15	49 21 50 33	3 13	Podalia and the leſſer Tartary.
	9	18 19	16 30 16 45	51 58 53 17	2 44	Batavia and Witenberge.
	10	20 21	17 0 17 15	54 29 55 34	2 37	Roſtoch.
	11	22 23	17 30 17 45	56 37 57 34	2 0	Ireland and Moſcovy.
terofcij.	12	24 25	18 0 18 15	58 26 59 14	1 40	Bohus a Caſtle in Norwey.
	13	26 27	18 30 18 45	59 59 60 40	1 26	Gothland.
	14	28 29	19 0 19 15	61 18 61 53	1 13	Bergis in Norwey.
	15	30 31	19 30 19 45	62 25 62 54	1 0	VViburge in Finland.
	16	32 33	20 0 20 15	63 22 63 46	0 52	Arotia in Sweden.
	17	34 35	20 30 20 45	64 6 64 30	0 44	The mouth of Darecally a riuer of Swedẽ
	18	36 37	21 0 21 15	64 49 65 6	0 36	Diverſe places of Norwey.
	19	38 39	21 30 21 45	65 21 65 35	0 29	Suecia, Alba Ruſſia.
	20	40 41	22 0 22 15	65 47 65 57	0 22	With many Ilands
	21	42 43	22 30 22 45	66 6 66 14	0 17	Thereunto adioyning,
	22	44 45	23 0 23 15	66 20 66 25	0 11	Wanting ſpeciall names,
	23	46 47	23 30 23 45	66 28 66 30	0 5	And Landmarkes.
	24	48	24 0	66 31	0 0	Iſland vnder the Artick circle.
erifcij,	Here the Climats are accoũted by the mõths from 66 Degr. 31 minut. where the day is 24 houres vnto the Pole it ſelfe ſet at 90 Degrees where the artificiall day is ſix Months.		Menſes			Theſe Climates are ſuppoſed to paſſe by Diverſe Ilands within the Artick circle, as Groenland, Iſland, Greenland: wherein as yet for the narrowneſſe of theſe climats comming neere together, and the vncertainty of obſervation no ſpeciall places haue beene aſſigned as to the other.
			1	67 15		
			2	69 30		
			3	73 20		
			4	78 20		
			5	84 0		
			6	90 0		

Theſe names being originally Greeke are taken from the diuerſe manner of dwelling of one nation in reſpect of another. The *Periœci* are called ſuch as dwell (as it were) about the Hemiſpheare in the ſame Parallell in two oppoſite points: the one in regard of the other being *Eaſterne*, the other *Weſterne*: ſo that they are ſuppoſed to differ the one from the other 180 degrees which is the ſemicircle: where we are to note, that theſe degrees are to be numbred, not in a greater but a leſſer Parallell, which is leſſe then the Equatour. For they which are vnder the Equator it ſelfe in 2 oppoſite points are to bee accounted rather Antipodes, although (for ought I ſee) the name might agree. The *Antœci* (as the name imports) are ſuch as dwell one againſt another, hauing one ſelfe-ſame Meridian and equall diſtance from the Equatour, the one in the Northerne, the other in the Southerne Hemiſpheare. The *Antipodes* (otherwiſe called *Antichthones*) may popularly bee deſcribed to bee ſuch as dwell feet to feet one againſt the other: ſo that a right line being drawne from one ſide to the other, will paſſe by the Center of the world: whence they preciſely are diſtant the one from the other 180° in a greater circle: wherein they are diſtinguiſhed from the *Periœci*, which are diuided by the degrees of a leſſer circle: ſuch compared one to the other are the *Americans* and the *Eaſterne Indians* about the riuer *Ganges*; the Inhabitants of *Peru* and *Calecute*: thoſe of *Peria* &



Summatra to *England* I finde no other Antipodes but the Sea, or at leaſt ſome parcell of land in the South continent neere *Pſittacorum Regio* : Here is to be noted that the former definition of *Antipodes* giuen by the ancients, was only to bee vnderſtood of the knowne habitable part of the Earth ; becauſe ſuch as dwell directly vnder the *Equatour*, or either of the *Poles*, although they may bee Antipodes agree not to that definition ; by reaſon the former are Antipodes only in oppoſite points of the Equatour : the other of the Meridian. Whether there were any Antipodes or no, was made a queſtion amongſt the Ancients, in ſo much that Saint *Auguſtine* in his booke *de ciuitate Dei*, and *Lactantius* in his third booke of *Inſtitutions*, ſeemes ſtiffely to defend the contrary : which opinion is ſuppoſed to grow out of their contempt or neglect of *Mathematicall* ſtudies, in thoſe ages wherein the zeale to religion was moſt vnneceſſarily oppoſed to Philoſophie, and the miſtreſſe forſaken of her beſt hand-maides : which ignorance of the Ancients was ſo farre deriued to poſterity, that in the yeere of our Sauiour 745 one *Boniface* Biſhop of *Mens*, was accuſed before the Pope *Zachary Virgilius* Biſhop of *Salisburg*, for hereſy, in that hee auerred there were Antipodes: The matter being firſt preferred to the King of *Bohemia*, and an appeale made vnto the Pope, it happened that the honeſt Biſhop for this aſſertion, was flatly condemned for hereticall doctrine, and inforced to recant his opinion : yet is it wonderfull how ſuch matters were thus decided : for granting theſe two eaſie grounds. Firſt that the earth is *Sphericall*; a propoſition proued in their time; 2 That euery place, or at leaſt two oppoſite places in the Terreſtriall Spheare may bee habitable; it muſt of neceſſity follow, that ſuch Antipodes muſt bee granted : which makes me to imagine that Saint *Auguſtine* abſolutely and groſſely denied not the *Antipodes*; becauſe in ſetting downe the premiſes and grounds of our opinion, hee ſeemed to vnderſtand them too well to deny a neceſſary induction, being a man of ſo great a wit and apprehenſion : but queſtionleſſe he thought that the Torrid Zone, which by moſt of the Ancients in his time, was reputed vnhabitable and vnpaſſable, no man had yet ſet his foot in thoſe remote parts beyond the line: ſo that it ſeemed in him not to ariſe out of ignorance of the conſtitution of the earthly Globe: but out of the receaued opinion of the Torrid Zone,and the vaſt Occan: the one of which hee held vnhabitable, the other vnpaſſable: from whence alſo ſprang vp an argument,or rather an idle fancie,that the Antipodes could not be admitted without granting another Sauiour, and another kinde of men beſides *Adams* poſterity: for if this coniecture had not taken place, the Pope (I ſuppoſe) would neuer haue proued himſelfe ſo ridiculous a Iudge, as to haue condemned *Virgilius* for hereſie. As for *Lactantius* (howſoeuer otherwiſe a pious eloquent Father) the weakeneſſe and childiſhneſſe of his arguments, will to any indifferent reader diſcouer his ignorance in the very firſt rudiments of Coſmographie. Here we may learne how farre religion it ſelfe is wronged by ſuch who ſet her oppoſite to all her ſeruants. But whatſoeuer the Ancients out of their glimring reaſon haue coniectured,our times haue ſufficiently decided this controuerſie; wherin ſuch Antipodes are eſtabliſhed both by reaſon and experience: which matter wee ſhall reſerue to our ſecond booke; wherein we ſhall declare how farre, and in what ſenſe the Earth may bee tearmed habitable.

1 *Thoſe which are to vs* Periœci, *are the* Antœci *to our* Antipodes:*our* Antœci *the* Periæci *to our* Antipodes: *likewiſe our* Periœci *are the* Antipodes *to our* Antæci.

This Propoſition as a Corollary may by neceſſary conſequence be deduced out of the precedent definition, and be well expreſſed out of the conſtitution of the artificiall Globe, and needs no farther demonſtration.

2 *The* Periœci, Antœci, *and* Antipodes are *diuerſly diſtinguiſhed in reſpect of the celeſtiall apparences.*

The proprieties of the *Periœci* are chiefly foure. 1 They haue the ſame eleuation of the Pole, and therefore the ſame temper of the yeere , and the ſame length of dayes and nights. 2 They dwell Eaſt and Weſt in regard one of the other. 3 They haue contrary times of dayes and nights : for when the one hath his Noone, the other inioyes his mid-night : likewiſe when the Sun with the one riſeth, it ſetteth with the other. 4 They haue the ſame Zone, Climate, and Parallell ; but differ by a ſemicircle, to wit , 180 degrees. To the *Antœci* they haue likewiſe aſſigned 5 proprieties. viz. 1 They inhabite the like Zones , but in diuerſe Hemiſpheares. 2 They haue the ſame eleuation of the pole, but not of the ſame pole : becauſe the one ſees the pole *Arcticke*, the other the pole *Antarcticke*, equally raiſed aboue his *Horizon*. 3 They haue Noone and Mid-night iuſt at the ſame times. 4 They inioy the ſame temper of the Heauens. 5 They haue the ſeaſons of the yeere contrary. For when the Southerne *Antœci* haue their Summer, the Northerne haue their Winter ; and contrariwiſe : when the Northerne haue their ſpring, theſe haue their Autumne. To the *Antipodes* they haue allotted 3 Proprieties. 1 That they haue the ſame eleuation of the pole, though not of the ſame pole. 2 They haue the ſame temper of the yeere , and the ſame quantity of dayes and nights. 3 They haue all the other accidents contrary : For when the one hath Night the other hath Day , when one Winter , the other Summer ; when the one the Spring , the other Autumne ; and contrariwiſe. Theſe accidents and proprieties here mentioned, muſt be vnderſtood in reſpect of the Heauens only. The qualities ariſing from diuerſe other Accidentall and particular cauſes in diuerſe places of the Earth, we ſhall differre vnto our ſecond part.

CHAP.

CHAP. XI.

Of the Longitudes and Latitudes.

1 THe diſtinction of the Terreſtriall Globe according to certaine *Spaces*, being formerly explaned, we are now to treat of the Diſtinction of the ſaid Spheare according to certaine *Diſtances.*

2 A Diſtance here we vnderſtand to be a direct line drawne betwixt two points in the Earth: ſuch a Diſtance is twofold, either *Simple* or *Comparatiue.*

3 The Simple Diſtance is taken from the two great circles, to wit the *Meridian*, or the *Equatour*: which is either the *Longitude* or *Latitude.*

The diuiſion of *Diſtances* into the *Simple* or *Comparatiue*, is moſt neceſſary: for it is one thing for a place abſolutely taken in it ſelfe, to be diſtant from ſome fixt point or other in the Globe: Another for two places to be compared betwixt themſelues in regard of ſuch a fixt point: for as much as the former implies only the diſtance betwixt two points, the other the diſtance of two ſuch points or places in reſpect of the third. Theſe points, from which ſuch points are ſaid to be diſtant, are either found in the Meridian Circle, from which the Diſtance is called Longitude; or elſe in the Equatour, whence we call it Latitude.

4 The Longitude is the diſtance of any place Eaſtward from the firſt Meridian.

To vnderſtand the better the Longitude, we muſt conſider that it may be taken two wayes: either *Generally*, or *Specially*: In the former ſenſe it is taken for the Diſtance of the whole Earth, ſtretched from the Weſt vnto the Eaſt, and contrariwiſe from Eaſt to Weſt. The bounds or limits of this Longitude were by *Ptolomie* and the ancient Coſmographers ſet no farther diſtant then the halfe circle, containing 180 degrees; becauſe the reſt of the Earth lay at that time vndiſcouered. The end of this ſpace towards the Eaſt, was the Kingdome of *China*, at the fartheſt part of all *India*, diſtant, as wee ſaid, from the *Fortunate* Ilands where *Ptolomie* placed the firſt Meridian, 180 degrees: which being taken in the Meridian, and reſolued into Miles, according to our former rules, will giue 10800 *Italian* miles: but this ſpace delineated out by the Ancients, was very ſcant and narrow in reſpect of the other parts ſince found out, being added to the former. For beyond the bound ſet by *Ptolomie* in the Eaſt, it is manifeſt that 60 degrees are found out and made knowne. An example whereof wee haue in *Scythia* without the mountaine *Emaus*, which is knowne to extend it ſelfe 60 degrees Eaſtward towards the Kingdome of *Cathay*, diſcouered by the *Portugals*: ſo that the breadth of the Earth Eaſtward is fully knowne ſo farre as 240 degrees, which being meaſured in the Equatour will amount vnto 14000 miles. Moreouer towards the Weſt, beyond the *Fortunate Ilands*, it is knowne to ſtretch to the fartheſt border of *America*; ſo that 340 degrees of the earth is fully detected, if not all the reſt being only 20 degrees, which are only deficient to make vp the whole circle. Which wee may the ſooner credit; becauſe our times haue brought forth (for ought any Authors haue related) the moſt excellent Nauigators of all ages, which haue ſayled the vaſt Globe of the Earth round about, and left behinde them a foundation whereon others might eaſily build. But to let paſſe the Generall Longitude of the Earth betwixt the Eaſt and the Weſt; Wee muſt vnderſtand that the Longitude here mentioned is to bee taken in a more ſpeciall ſenſe, for the Diſtance of any place from the firſt Meridian, being placed either in the *Canaries*, as the Ancients would haue it, or in one of the *Azores* according to the latter Geographers. This then muſt be the bound from whence wee muſt beginne our account; The ſubiect wherein the number of degrees may bee taken, may bee the Equatour or Parallell. Whence by ſome the Longitude of a place is defined to bee an Arch of the Equatour or Parallell intercepted betwixt the firſt Meridian and the verticall point of the place propoſed: ſo that by neceſſary conſequence, ſuch places as are ſubiect to the ſame Meridian, in the ſame Hemiſpheare, Eaſterne or Weſterne, haue the ſame Longitude, which is the diſtance from the point of the Weſt: but places declining more towards the Eaſt haue the greater Longitude; but neerer to the Weſt, leſſe.

1 *Places inioying the ſame Longitude are not alwayes equally diſtant from the firſt Meridian, and contrarywiſe places equidiſtant from the firſt Meridian haue not alwayes the ſame Longitude.*

The reaſon is euident out of that which hath beene often ſpoken before: becauſe the degrees of a greater circle are greater, of a leſſer leſſe, according to the greatneſſe of the circle. Now the Longitude of a place meaſured in the Equatour, will anſwer to 60 *Italian* miles: but in other Parallels leſſe.

2 *The difference of Longitudes begets the difference of Times: Thoſe therefore which exactly are ſubiect to the ſame Longitude, haue their Noone at the ſame moment: but where the Longitudes are different, the Noonetides are alſo different.*

That the difference of time is varied according to the difference of Longitude in diuerſe parts of the Earth, is a matter obuious to euery mans vnderſtanding, out of two premiſed grounds. 1 That the Earth is Sphæricall. 2 That the Sunne in his Diurnall courſe once in 24 houres compaſſeth it round: whence it comes to paſſe that places ſituate *Eaſtward*, ſee the Sunnes ſooner then thoſe which are placed in the Weſt, and that with a proportionall difference of time, that to euery houre in the Sunne motion is aſſigned a certaine number of correſpondent miles: which is in ſome ſort expreſſed in a Geographicall Globe or Map, wherein we ſhall finde deſcribed 12 Meridians, which diuide the whole compaſſe of the earthly Spheare into 24 equall parts; in ſuch ſort that betwixt each of the two neereſt Meridians, are reckned 15 degrees, which make one houre: by which wee may more eaſily vnderſtand how ſoone the Noone-time happens in one Citty before another: for if one Citty ſtands Eaſtward from another the ſpace of three of thoſe foreſaid Meridians, it is euident that it will inioy noone three houres before the other. The reaſon of this difference of times, is the difference of Longitudes, wherein to euery houre the Coſmographers haue allotted 15 degrees in the Sunnes Diurnall motion: ſo that 15 degrees multiplied by 24 houres, which is the whole naturall day, there will bee produced 360 which is the number of degrees in the whole circle,

3 *If two men from the ſame place trauell, the one* Eaſtward, *the other* Weſtward *round about the Earth, and meet in the ſame place againe: they ſhall finde that he which hath gone Eaſtward hath gotten, and the other going Weſtward hath loſt a day in their account.*

This is without difficulty to be vnderſtood, out of the change of Longitudes, ſeconded by their trauell, varying perpetually the quantity of the day: for it is manifeſt, that hee who from any place aſſigned ſaileth Eaſtward mouing continually againſt the motion of the Sunne, will ſhorten ſomewhat of his day; taking away ſo much from it, as his iourney in proportion of diſtance, hath oppoſed and anticipated in the time the Diurnall courſe of the Sunne : ſo that daily gaining ſomething from the length of the day, which muſt bee elſewhere recompenced. It muſt needs be, that in the whole circuite of the earth, it will amount to 24. houres, correſpondent to the whole circuite of the Sunne, and the compaſſe of the earth, which will make another day: Likewiſe, if we ſuppoſe another in compaſſing about the earth, to goe Weſtward, it cannot bee otherwiſe imagined, but that ſeconding the courſe of the Sunne, by his owne iourney; hee will daily adde ſomewhat to the length of his day, anſwerable to his diſtance, from the place wherein hee began to follow the Sunne in his courſe from Eaſt to Weſt. The daily addition to the length of the day, proportionall to the longitudes which he changeth, (the Sunne running a like courſe) muſt daily diminiſh ſomewhat of the Diurnall courſe of the Sunne, and ſo at his iourneyes end, which was ſuppoſed to be the whole circuite of the earth, anſwerable to 24. houres in the Sunnes courſe, it will looſe a whole day. To demonſtrate both theſe caſes, wee will imagine in ſuppoſition, that of theſe two trauaillers going the one Eaſtward, the other Weſtward, the former ſhould take away from the length of the day, or the latter adde to it for euery 15. miles one minute. Then by the golden Rule, if 15. miles either ſubtract or adde one minute in the length of the day, muſt 21600. miles, which is the whole compaſſe of the earth, according to the ſame proportion, either ſubtract or adde 1440 minutes, which make 24. houres, the length of the naturall day. To confirme the demonſtration by popular experience, I remember I haue read in the *Hollanders* diſcouery of *Fretum de Mayre*, that comming home into their owne Countrey, they found by comparing their accounts with their countreymens at home, they had loſt one day, hauing gone Weſtward, and ſo compaſſed the earth round. Hence will ariſe diuers conſectaries not vnpleaſing to be ſcann'd. One I will touch not much diſſonant from our purpoſe; *That three men reſiding* *in the ſame place at one time, ſhall notwithſtanding all vary one from the other in the dayes of the weeke, keeping yet an exact account:* which to explaine the better, wee will ſuppoſe a *Jew*, a *Sarazen*, and a *Chriſtian*, reſiding in the ſame towne together: It may ſo happen according to our former grounds, that the *Sarazen* according to the Law of *Mahomet*, ſhall obſerue his Friday, the *Iew* his Saturday, being his Sabboth: and the *Chriſtian* the Lords day, being the Sunday; yet ſo, as all ſhall happen on the ſame day: all of them excluding any errour in their calculation. For ſuppoſition ſake, wee will place them all at one time all together in *Paleſtine* on a Saturday; at which time, let vs imagine the *Sarazen* to take his iourney Weſtward, the *Chriſtian* Eaſtward, ſo as both of them in their coaſts compaſſe the world, to meet againe in the ſame place: The *Iew* all the while we ſuppoſe reſident in the ſame place: it will follow by neceſſary conſequence, that the *Sarazen* going about the earth Eaſtward, will looſe one day; the *Chriſtian* iourneying Weſtward, will gaine one day: the *Jew* remaining in the ſame place, will neither gaine nor looſe. Theſe three men then, meeting together againe after a yeere, two, or three, at the ſame place, muſt needs make a diuers account; for one and the ſelfe-ſame day, will bee to the *Sarazen* Friday, to the *Iew* Saturday, and to the *Chriſtian* Sunday, if they exactly calculate the time from their firſt meeting, to their returne vnto the ſame place. Mee thinkes this, if there wanted other Arguments, were a reaſon ſufficient to conuince ſome ſtrait-laced men, who rigidly contend our Lords day (which they erroneouſly tearme the Sabboth) to bee meerely morall, as grounded on the Law of nature. If it were ſo, according to our premiſes before demonſtrated, this abſurditie would enſue neceſſarily: That the Morall Law, which they call alſo in a ſort the Law of nature, is ſubiect to manifold mutation, which by our beſt Diuines is vtterly denied. The conſequence will eaſily follow, becauſe it cannot be denied by any Chriſtian, but that all nations of the world iſſued from *Noahs* Arke, the Seminary of mankinde, and ſpread themſelues from thence ouer the face of the whole earth, ſome farther, ſome at a ſhorter diſtance: whereby changing the longitude with their habitation, they muſt of neceſſity alter the differences of times, wheron they ſeeke to ground their Sabboth. Neither at this day can any man exactly and preciſely obſerue any one day, either as it was firſt appointed by *Moſes* in the *Leuiticall* Law, as it was inſtituted by Chriſts Apoſtles afterwards; by reaſon of the manifold tranſportation of colonies, and tranſmigration of Nations from one Region into another, whereby the times muſt neceſſarily bee ſuppoſed to vary. And if any more moderate ſhould vrge, that not the exact ſeuenth day from the firſt inſtitution, bound vs to obſeruation; ſo one day in ſeuen bee obſerued: it can hardly paſſe without exception, for as much as if any man, as *Magellane*, *Drake*, or *Candiſh*, ſhould trauaile the world about, a day muſt needs be varied, as we haue ſhewed. Here I would willingly demand, whether ſuch trauailers returning home into their owne countreyes, ſhould celebrate the ſame Lords day according to the inſtitution of their owne Church; or elſe as they finde according to their owne account: If they obſerue the latter, they muſt ſchiſmatically diuide themſelues from the Church, and keepe a Sabboth of their owne, which in euery mans iudgement would be thought abſurd, as the mother of many inconueniences: If the former take place, then muſt the day be changeable in his nature, and ſo one day of ſeuen of them ſhould not be obſerued. I ſpeake not this to cheriſh any neglect of the duty we owe that day, but rather to proue it not meerely to be grounded on the Law of Nature, as ſome would perſwade; but rather an *Eccleſiaſticall* conſtitution, deriued (as it ſeemes moſt probable) from the Apoſtles, though not in practice in Chriſts time, wherein the *Jewiſh* Sabboth was not yet aboliſhed: But I haue dwelt too long on this, & may perhaps incurre ſharpe cēſure, for wading too farre into the depth of Diuinity: But my Apology ſhall be this, that albeit I haue gone beyond my preſent ſubiect, I haue not yet tranſcended the limits of my profeſſion: I ſerue no faction, and therefore dare aduenture my language as free as my opinion.

5 Concerning the longitude, two things are to be knowne, 1. The Inuention. 2. The Expreſſion. The Inuention propoſeth vs the way and manner of the firſt finding out of the longitude of places.

There are few things in nature which haue more perplexed the wits of ingenious *Mathematicians*, then the exacteſt way of finding out the longitude of places: Not that the matter was ouer difficult in it ſelfe, but that they ſought out a way to performe this concluſion, not depending from the obſeruation of the celeſtiall bodies and motions; a matter as yet neuer found out, and I feare mee vnpoſſible: Becauſe they propoſed to themſelues one of theſe two wayes to finde it out; either by ſome magneticall inſtrument, or elſe by induſtry of nauigation: neither of which can much profit. Not the former, becauſe there haue neuer beene any fixed points found in the *Equatour*, betwixt Eaſt and Weſt, as betwixt North and South haue beene obſerued: ſo that nothing can proceed out of the meere nature of the earthly Globe, whereon wee may ground any difference of longitude: Neither is the ſecond very beneficiall, for that all voyages both by Sea and land, are very irregular and vncertaine, either by reaſon of ſundry impediments, as rockes, mountaines; woods; contrary winds, and other dangers turning aſide the direct courſe of paſſengers from any direct way, or obſeruation; or elſe by the Ignorance of Mariners, which ſeldome paſſe ſo farre on diſcouery: and if they doe, know not perfectly to delineate out their iourney, as a *Coſmographer* would expect, to any tolerable ſatisfaction. Neuertheleſſe, by Aſtronomicall obſeruation, wee haue many wayes left vs for the performance of this concluſion, as ſhall bee taught in theſe following propoſitions.

1 *By an Eclypſe of the Moone, the longitude may be found.*

This concluſion is in this ſort to bee performed: Firſt, it behooueth you to know, as you may by an *Ephemerides*, at what houre an Eclipſe ſhall happen at ſome knowne place, whereof you are well informed of the longitude: Then muſt bee obſerued by an Aſtrolable, or other Aſtronomicall inſtrument, at what houre this Eclipſe begins at that place, whereof you would willingly know the longitude: If the Eclipſe doe beginne in both places the ſelfe-ſame time, you may aſſure your ſelfe that theſe two places differ not in longitude. But if there be a difference in the time, then muſt there be a difference in the longitude, which to finde out, you may in this ſort proceed: Take the leſſer ſumme of houres out of the greater, and there will be remaining, either houres or minutes, or both: If there remaine houres, then multiply the ſame by 15; if minutes, diuide the ſame by 4; (for in this account as wee haue taught, 15. Degrees make an houre) and adde the difference ſo found vnto the longitude, if the Ecclipſe appeare there ſooner: but if later, ſubtract it from the longitude formerly knowne. If there remaine any minutes after the diuiſion, you muſt multiply thoſe minutes by 15; and ſo ſhall yee haue the Minutes of Degrees. To explaine this the better, wee will take this familiar example from ſome of our later writers. The longitude of *Paris* was ſet downe by *Ptolomy*, to be 23 degrees; now we may be informed by an Ephemerides, that a certaine Eclipſe of the Moone beginnes there 3 houres after midnight; out of this I would willingly learne the longitude of *Tubing* a towne in *Sueuia*: In this towne I obſerue by ſome Aſtronomicall inſtrument, at what houre the Eclipſe there beginnes, which I finde to bee at three of the clocke and 24 minutes after midnight. Then by the ſubtraction of the leſſer number of time out of the greater, I finde the remainder to be 24 minutes, which diuided by 4. which makes one degree, the quotient will bee 6. degrees: and that is the difference, which if you adde to the knowne longitude of *Paris* (becauſe the Eclipſe begins there ſooner then at *Paris*) it will amount to 29 degrees: wherby we may collect that the Longitude of *Tubing* is 29. degrees. To this rule for the moſt part are ſquared all *Coſmographicall*

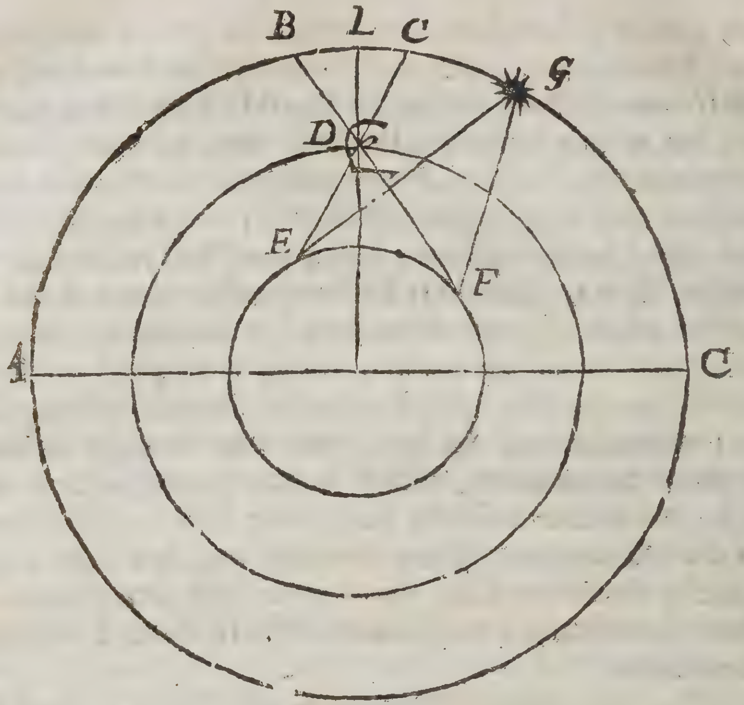
Tables of longitude, but yet in this happen diuers errours: 1. Becauſe oftentimes in the Artificer there wants diligence in obſeruing the right houre & moment of the Eclipſe. 2. The diuers Epacts & latitudes of the Moone are commonly neglected; wherfore ſome haue thought it the beſt way (if it were to be hoped) that diuers exact Aſtronomers ſhould at diuers places obſerue the ſame Eclipſe, and ſo by conferring together according to the former Rule, finde out the longitudes of thoſe places. But exact Aſtronomers cannot be ſo eaſily found in euery citie, wherof we deſire to know the longitudes; or if there were ſuch, they keepe not alwaies ſuch correſpondency in friendſhip; neither is an Eclipſe of the Moone alwayes at command. Neuertheleſſe, this way is not to bee deſpiſed, becauſe where better wayes are wanting, wee muſt content our ſelues with what we finde.

2 *By a Clocke, Watch, or Houre-glaſſe, to finde out the longitude of a place.*

This concluſion is to be performed in this manner; You muſt get you a watch or clocke, apt to runne (if you can) 24 houres; this watch muſt you, by the helpe of an *Aſtrolabe*, rectifie and ſet iuſt at ſuch time as you depart from the place where you are, as bound to any other place, whereof you deſire to inquire the longitude: during which time, your diligent care muſt be to preſerue your watch in motion without intermiſſion: being at laſt arriued at the place whereof you inquire the longitude, you were beſt to ſtay till ſuch time as the Index ſhall preciſely point out ſome perfect houre: At the ſame inſtant it muſt bee knowne by an *Aſtrolabe*, what houre it is at the place where you are arriued; for if your *Aſtrolabe* and *Watch* ſhould both agree in one, you might aſſure your ſelfe that there is no difference of longitude betwixt the place whence you came, and the place whereto you are arriued: For it is euident that in this ſort your iourney hath beene either directly North or directly South vnder the ſame Meridian. But if this differ either in houres or minutes, they muſt be reduced vnto degrees in ſuch ſort as we haue ſhewed in the former way. Through which you may finde out the Longitude which you deſire to know: This inuention is by our Countryman *Blundeuill* aſcribed to *Gemma Friſius*; although I ſhould take it to bee more ancient: but whoſe inuention ſoeuer it was, certainly it cannot but commend the Authour. *Peter Martyr* in his Decades, ſeemes to preferre this way before all the reſt; neuertheleſſe in this I cannot aſſent to his opinion, being one I had rather truſt as an Hiſtorian, then as a iudicious Coſmographer: becauſe the way cannot but admit of great vncertainty: in ſo much as a Watch or Clocke will moue inequally, being corrupted with ruſt, eſpecially on the Sea, which alwayes abounds with moiſt vapours: wherefore on the Sea, ſome haue thought an Houre-glaſſe more conuenient, which is true in compariſon of the Watch; but neither will the ſands of an houre-glaſſe keepe alwaies the like motion: If any certainty may bee this way, it muſt bee by the helpe of the *Automaton* or perpetuall moueable, of whoſe inuention we may ſooner deſpaire then of finding out this concluſion.

3 *By the diſtance betwixt the Moone and ſome knowne Starre, which is ſituate neere the Eclipticke, the* Longitude *may be found out.*

This way was taught by *Appian*, illuſtrated by *Gemma Friſius* and *Blundeuill*, to whoſe manner of explication, wee haue for farther illuſtration added a figure of the *Parallax* whereon this inuention is grounded. Firſt then to ſhew this concluſion, wee muſt firſt lay this ground: that the Diſtances betwixt the Moone and other ſtarres in the firmament are varied according to the difference of places: In ſo much as two men liuing farre diſtant in diuers places of the earth, beholding at one time the Moone and ſome other knowne fixt ſtarre, will not finde the like diſtance betwixt them: whereof if any man doubt, he may be informed by this figure. Wee will imagine O to be the place of the Moone, as ſeated in the lower Orbe; G to bee the place of the fixt ſtarre, whoſe diſtance from the Moone is inquired: E and F two ſtations and habitations of men dwelling on the earth, whereof wee may imagine the one to bee in *Europe*, the



other in *America*: It will be manifeſt that the inhabitant ſituate in F will behold the Moone in the point B; and the ſaid fixt ſtarre in G: (becauſe as the *Optickes* teach vs, all things are ſeene in the places oppoſite to the eye) ſo that the diſtance betwixt the Moone and the ſaid ſtarre, will bee the Arch of the greateſt Circle B G of the other ſide: the inhabitants ſituate in E, will behold the Moone by the ray E C in C, as likewiſe the ſaid fixt ſtarre G in the point G, by the ray E G: ſo that the diſtance betwixt the Moone and the fixt ſtarre, will bee in that ſtation the Arch of the circle C G. Now by the firſt common *Axiome* of *Euclide*, euery man muſt grant that the Arch of B G is greater then C G, the former being the whole, and this the part. Secondly, out of the ſame ground, wee may as eaſily collect that this diſtance betwixt the Moone and ſome other knowne fixt ſtarre is varied proportionally, according to the diſtances of the places on the earth, becauſe ſo many places as there are, ſo many diuerſity of aſpects will ariſe, being increaſed or diminiſhed, according to the diſtances of places on the Terreſtriall Globe: This concluſion thus demonſtrated, wee muſt proceed to practice in this manner, as is taught by *Gemma Friſius*: Firſt, it behooueth you to ſearch out by the helpe of *Aſtronomicall* Tables, the true motion of the Moone, according to the Longitude, at that time of your obſeruation at ſome certaine place, for whoſe *Meridian* the rootes of thoſe Tables are calculated. 2. You muſt know the Degree of Longitude of ſome fixed ſtarre, nigh vnto the Eclipticke, either preceding or following the moouing of the Moone. 3. You muſt ſeeke out the Diſtance of moouing of the Moone, and the ſaid ſtarre. 4. The diſtance once had, apply the croſſe-ſtaffe to your ſight, and ſo mooue the Croſſe to and fro, till you may behold the Center of the Moone, at the one ende, and the fixed ſtarre with the other. So ſhall you ſee expreſſed by the Degrees and Minutes marked on the ſtaffe the diſtance of the Moone and the ſaid ſtarre correſpondent to the place of your obſeruation: which being noted, ſet downe alſo the diſtance betwixt the Moone and the foreſaid Starre which was firſt calculated. Then ſubtract the leſſer from the greater, the reſidue will ſhew the leaſt difference: which being diuided by the moouing which the Moone maketh in one houre, you ſhall know the time in which the Moone is or was ioyned with the firſt diſtance of the foreſaid ſtarre. Then hauing conuerted that time into degrees and minutes, the reſt will be performed either by addition or ſubſtraction of the Product thereof to or from that Meridian: for which the Tables where by you firſt calculated the motion of the Moone, were appointed and verified. If the diſtance betwixt the Moone and the fixt Starre of your obſeruation bee leſſer, then muſt you adde the degrees and minutes to the knowne Latitude, ſo ſhall you finde the place of your obſeruation to bee more Eaſtward. If it bee greater, then ſubſtract the degrees and minutes from the knowne Longitude, and the place of your obſeruation in this regard will bee more Weſtward. Theſe rules are ſo farre true that the Moone bee ſuppoſed to bee more Weſtward then the fixed Starre: for if otherwiſe, your working muſt be cleane contrary: to wit, if the diſtance betwixt the Moone and the fixed Starre bee leſſer, you muſt ſubtract the degrees and minutes from the knowne Longitude: ſo ſhall the place of your obſeruation bee more Weſtward: but if it bee greater, then muſt you adde the degrees and minutes vnto the knowne Longitude, and the place of your obſeruation ſhall bee found Eaſtward. This way, though more difficult, may ſeeme better then all the reſt: for as much as an Eclipſe of the Moone ſeldome happens, and a watch, clocke, or houreglaſſe cannot ſo well bee preſerued, or at leaſt ſo well obſerued in ſo long a voyage: whereas euery night may ſeeme to giue occaſion to this experiment: if ſo bee the ayre bee freed from clouds, and the Moone ſhew her face aboue the Horizon.

4 *By the obſeruation of the difference in the Sunnes and Moones motion, the Longitude of places may be found out.*

To explane this propoſition, wee will ſet downe three things. 1 Certaine *Poſtulata*, or granted Axioms. 2 The example. 3 The manner and practiſe: The grounds or propoſitions which wee take as granted of all Mathematicians are theſe. 1 That the motion of the Moone is 48 minutes of an houre ſlower in 24 houres, or 360 degrees, then that of the Sunne. 2 That by obſeruation of the heauens, and other Mathematicall helpes, an Artificer may know in any place firſt the Meridian: Secondly the houre of the day: Thirdly the time of the Moones comming to the Meridian. 3 The time of the Moones comming to the Meridian may bee knowne by an *Ephemerides*: Theſe things granted; wee will ſuppoſe for example, that in *London* the Moone on ſome ſet day comes to the Meridian at foure of the Clocke after Noone: 2 That in ſome part of the *Weſt-Indies*, the Moone bee obſerued to come to the Meridian the ſame day at 10 minutes after foure. Theſe grounds thus ſet downe, the diſtance of Longitude of that place Weſtward from *London* may bee found out. The manner of practiſe is thus to bee wrought by the golden Rule. If the difference of the Sunnes and Moones motion bee 48 minutes of an houre in 360 degrees, what will it be in 10 minutes? The fourth proportionall number will bee 75 degrees, the diſtance of Longitude of the place aſſigned from *London*, in Weſt Longitude; from which number the Longitude from *London* being ſubtracted, and the remainder from 360, the reſidue will ſhew the Longitude. If the Moone in the place aſſigned come ſooner to the Meridian, wee muſt count ſo much in Eaſt Latitude. This way I firſt found in Mr *Purchas* his relation of *Halls* diſcouery of *Groenland*, written by *William Baffin* ſince this Chapter came vnder the Preſſe: the expreſſion of which, being as I ſuppoſe ſhorter and eaſier then in the Author, I doe owe for the moſt part to my worthy Chamber-fellow, Mr *Nathanael Norrington*, to whoſe learned conference, I confeſſe my ſelfe to owe ſome fruits of my labours in this kinde, and all the offices of friendſhip. This manner of inuention, for mine owne part, I preferre before all the reſt, both for certainty and facility: and (as it ſhould ſeeme by *Baffins* practiſe) it is more in vſe amongſt Marriners then the former, howſoeuer leſſe mentioned amongſt writers.

14 Thus much for the *Inuention* of the Longitude: the *Expreſſion* is the imitation of the Longitude on the face of an Artificiall Globe or Mappe; which is directed by theſe Rules.

1 *The place whereof wee deſire to know the* Longitude *being brought to the Braſen* Meridian, *the degrees of the* Equatour *will ſhew the Longitude.*

This Rule may eaſily be explaned by theſe three precepts. Firſt that you muſt turne round the Globe on his Axell-tree, till you bring the place whereof ſeek the Longitude vnder the braſen Meridian. 2 You muſt diligently and exactly marke what degree the Meridian cuts in the Equatour. 3. You muſt number how many degrees that point is diſtant from the firſt Meridian, and the number will giue you the true Longitude ſought after This alſo may be performed without turning of the Globe, if ſo be any other Meridian in the globe ſigned out ſhall paſſe by the ſaid place. For this Meridian will cut the Equatour in ſome degree or other, which being numbred, as before from the firſt Meridian, will ſhew the direct Longitude: the like of which we haue in the ſecond caſe.

2 *The Meridian running through any place of the* Geographicall *Table, will point and deſigne out in the Equatour the degrees of* Longitude.

This may eaſily bee taught by the former way performed on the Globe: as for example, if I ſhould inquire the Longitude of *Paris* the *Metropolis* of *France*, in a Geographicall Map, I finde a Meridian markt out which runs, if not directly through yet very neere the ſaid City. This Meridian I trace along to the Southerne part, till I finde it to meet and cut the Equatour. Then obſerue I in what degree of the Equatour it makes his interſection, and I finde it to bee 23 degrees 20 minutes, which is the Longitude of the place.

15 Hauing ſpoken of the *Longitude*, the *Latitude* comes in the next place to bee handled: the Latitude is the Diſtance of any place from the *Equatour*, either North or South.

What we haue ſpoken of the Longitude muſt alſo agree to the Latitude, that it is taken ſometimes abſolutely and generally, ſometimes ſpecially: in the former ſenſe it ſignifies any diſtance or ſpace betweene North and South, or contrariwiſe from South to North. Amongſt the Ancients was the breadth or Latitude held to bee about 80 degrees, ſo that the vtmoſt bound or limit to it Northward was called *Thule*, which commonly is ſuppoſed to bee *Iſland*. But the latter Nauigatours through their diligence haue detected ſo much land that it is found to ſtretch beyond 81 degrees toward the North, and 45 toward the South, and much farther if we will beleeue the relation of *Ferdinand de Quir*, a Spaniard, who boaſts a more ample diſcouery of the *South Indies*, then euer before hath beene knowne. But howſoeuer, the Latitude here define is taken in a more ſpeciall and ſtricter ſenſe for the diſtance of any place from the equinoctiall line, bee it either toward the North or the South. The bound therefore from which we begin our account of Latitude is the Equatour: but the ſubiect wherein it is meaſured is the Meridian: ſo that it is cleane oppoſite to the Longitude, for that was limited by the Meridian, and meaſured in the Equatour. The Latitude of a place is alwayes equall to the Eleuation of the Pole, as wee ſhall ſhew hereafter, and is diuided into the Northerne and the Southerne Latitude, whereof the one is from the Equatour Northward, the other Southward.

16 Concerning the Latitude are to bee conſidered the *Inuention*, and the *Expreſſion*: the Inuention is againe twofold, *Aſtronomicall* or *Magneticall*.

17 The *Aſtronomicall* Inuention of the Latitude is by obſeruation of the Starres, which is directed by theſe Propoſitions.

1 *The* Meridian Height *of the Sunne at the time of the* Equinoctiall *ſubtracted from 90 degrees, will ſhew the true* Latitude *of the place.*

The height of the Sunne at Noone may be found by the *Aſtrolabe*, *Croſſe-ſtaffe*, *Quadrant*, and many other Aſtronomicall inſtruments, but in taking the Meridian Altitude, it is very fit and requiſite that it bee obſerued diuerſe times one after another with ſome little ſpace betwixt, to trie whether it increaſeth or decreaſeth; for if it doth increaſe, then aſſure your ſelfe it is not full Noone; if it decreaſe it is paſt Noone: hauing thus found out the Meridian Altitude, you muſt ſubduct it from 90 degrees, and the reſidue will bee the true Latitude of the place, if ſo bee it bee obſerued at the time of the Equinoctiall, when the Sunne enters the firſt point of *Aries*, or *Libra*: as for example here at *Oxford* I obſerue the Meridian height of the Sunne about the eleuenth of March, and I finde it to bee about $37\frac{1}{2}$ degrees, or thereabout, which I ſubtract out of 90, the whole Quadrant, and the reſidue will bee $51\frac{1}{2}$, which is the Latitude of the place. But if you would know the Latitude at any other day, or time of the yeere, then muſt you proceed in this manner: hauing taken the height of the Sunne at Noone (as before) you muſt by the Table of Declination learne the true degree of the Sunnes declination. 2 If ſuch declination bee Northernely, then muſt you ſubtract it from the foreſaid Altitude or height. But if Southernly, you muſt adde it to the Altitude: and by ſuch addition and ſubtraction, ſhall you haue the height of the equinoctiall aboue the Horizon. 3 This height of the Equinoctiall aboue your Horizon, being as before ſubtracted from 90, will bee the true Latitude of the place aſſigned: as for example, the 15 of Auguſt I obſerue the Declination of the Sunne to bee about 10 Degrees, the Sunne being in 2 Degrees of *Virgo*: I finde the Meridian height of the Sunne to be 48 degrees or thereabouts. Now becauſe the Sunne being in *Virgo*, hath a Northerne Declination, I ſubtract 10, which is the number of the declination, out of 48 the height of the Sunne, and there will remaine 38, which againe taken out of 90, the reſidue will be about 52, the common receaued Latitude of the place.

2 *The Meridian height of any Starre, the Declination ſubtracted, if it bee Northerne, or*

added if it bee Southerne, being ſubtracted out of 90, will ſhew at any time of the yeere the Degrees of Latitude.

The former rule ſerues onely for the day; becauſe it is performed by the obſeruation of the Sunne, but this latter may bee more neceſſary for Marriners, (who now and then are inforced to inquire the Latitude of a place in the night when the Sunne ſhines not: wherfore they muſt flie vnto ſome knowne Starre, by obſeruation of which they may eaſily performe the ſame; according to the rule: which differres nothing at all from that which wee ſpeake of the Sunne out of the Equinoctiall, and therefore need no other expoſition then a bare example: let the fixt ſtarre you beſt know, bee *Arcturus*, whoſe Meridian Altitude you finde by your Mathematicall inſtrument to bee 59 Degrees, and 30 minutes: then ſhall you learne by ſome Table that his Declination Northward is 21 degrees, 30 minutes: now becauſe his declination is Northward, you muſt ſubtract it out of his Meridian Altitude, and you ſhall finde the remainder to bee 52 Degrees, which is the Latitude for the place: as it is commonly taken, although I confeſſe it might be more exact: being obſerued here at *Oxford*, be found rather 51 Degrees and 30 minutes.

18 The Magneticall Inuention is performed by the Magneticall Inclinatory Needle.

The ground of this Magneticall inuention is from the proportion betwixt the magneticall inclinatory Needle, and the Latitude of the Earth: for as wee haue proued in the 13 Propoſition of the 3 Chapter; the Magneticall inclinatory Needle will at euery point of Latitude conforme it ſelfe to certaine Angles with the Axell of the Earth proportionally to the Degrees of that Latitude: vpon which grounds D^{r} *Ridley* hath inuented a curious inſtrument to finde out the Latitude for any place aſſigned, and for this vſe hath calculated Tables, which wee hope will bee inlarged by our *famous Profeſſor* M^{r} *Brigges*: for my part, hauing neuer ſeene this inſtrument, or knowne the vſe, I cannot enter on the deſcription of it vntill ſuch time as I ſhall haue occaſion to acquaint my ſelfe with it.

19 The Expreſſion is the imitation of it on the artificiall Speare: which is againe either *Aſtronomicall* or *Magneticall.* The former is performed by the ordinary Globe according to this rule.

1 *The point of any place or Citty firſt found in the Globe being brought to the braſen Meridian, will ſhew in the Degrees of the ſame Meridian the true* Latitude *of the ſame place.*

This may eaſily be ſhewed in this manner by an example; If I would willingly finde out the Latitude of *Oxford* in the Globe, I firſt finde out the place in the Globe, which hauing found, I turne the Globe till I haue brought the place iuſt vnder the braſen Meridian: then I note what degree it deſignes, and that ſhewes mee the true Latitude of the place, which I finde to bee 52, or thereabouts: but if you would finde it in a Mappe or Chart, in which there is no ſuch braſen Meridian, you muſt take the Parallell of the place, or at leaſt the next vnto it, pointed in the ſame Mappe: Then note what degree the ſaid Parallell cuts in the firſt Meridian; for that will ſhew the true Latitude of it by the right Parallell of the place, if not the next; ſo that by addition, or ſubtraction, you may eaſily gueſſe at it.

20 The *Magneticall* Expreſſion depends from the Application of the *Inclinatory Needle* to the *Terrella.*

The Magneticall inclinatory needle is ſaid to conforme it ſelfe in the ſame manner to the Terrelſa or Loadſtone, being artificially thereunto applied, as it doth to the great Globe of the Earth: ſo that no doubt is, but an imitation of the Latitude may

¶ A Table expreſſing the proportion of the Magneticall Inclination to the degrees of Latitude, and Eleuation of the Pole.

Eleuat. Poli.	*Inclination to the Horizon.* I. II.			*Eleuat. Poli.*	*Inclination to the Horizon.* I. II.			*Eleuat. Poli.*	*Inclination to the Horizon.* O. I. II.		
1	2	11	15	31	52	26	38	61	79	28	51
2	4	10	13	32	53	46	55	62	80	31	36
3	6	26	55	33	54	53	51	63	80	37	54
4	8	31	23	34	56	3	56	64	81	10	47
5	10	33	41	35	57	13	25	65	81	42	36
6	12	23	50	36	58	21	19	66	82	13	23
7	14	37	53	37	59	27	50	67	82	43	9
8	16	27	52	38	60	32	59	68	83	11	56
9	18	21	50	39	61	36	46	69	83	39	45
10	20	13	47	40	62	39	0	70	84	6	37
11	22	3	45	41	63	39	56	71	84	32	30
12	23	51	46	42	64	39	29	72	84	57	24
13	25	37	52	43	65	37	41	73	85	21	22
14	27	22	4	44	66	34	31	74	85	44	24
15	29	4	23	45	67	30	0	75	86	6	31
16	40	44	53	46	68	24	10	76	86	27	44
17	32	23	34	47	69	17	2	77	86	48	5
18	34	0	27	48	70	8	38	78	87	7	36
19	35	35	35	49	70	58	59	79	87	26	18
20	37	9	0	50	71	48	7	80	87	44	9
21	38	40	42	51	72	36	0	81	88	1	10
22	40	10	41	52	73	22	38	82	88	17	23
23	41	38	58	53	74	8	2	83	88	32	49
24	43	5	37	54	74	52	11	84	88	47	29
25	44	30	26	55	75	35	6	85	89	1	22
26	45	53	43	56	76	16	51	86	89	14	30
27	47	15	25	57	76	57	28	87	89	36	54
28	48	35	33	58	77	36	59	88	88	38	37
29	49	54	8	59	78	15	23	89	89	39	39
30	51	11	9	60	78	52	41	90	96	0	0

Place this Table after page 252 in the firſt Booke.

in the ſame manner to the Terrella or Loadſtone, being artificially thereunto applied, as it doth to the great Globe of the Earth: ſo that no doubt is, but an imitation of the Latitude may bee expreſſed on the little earth, or loadſtone: for which vſe, diuers curious inſtruments haue beene deuiſed by magneticall Philoſophers, to whom I referre my Readers: becauſe I (as I ſaid) haue little acquainted my ſelfe with the vſe of ſuch inſtruments.

CHAP. XII.

Of the diſtances of places compared one with another.

1 OF the *ſimple* and *abſolute* diſtinction of diſtances, wee haue treated in the former Chapter: wee muſt in the laſt place handle it *comparatiuely*; that is to ſay, one place compared with another: whereof wee are to conſider the *Jnuention* and *Expreſſion*.

2 The diſtance is the meaſured ſpace betwixt two places: which is, either *vniforme*, or *various*: vniforme is in places different, either in *Longitude* onely, or in *Latitude* onely.

3 Thoſe places differ in *Longitude* onely, which are ſituate vnder the ſame or like Parallels, but diuers *Meridians*; or at leaſt vnder op-

poſite points of the ſame *Meridian.*

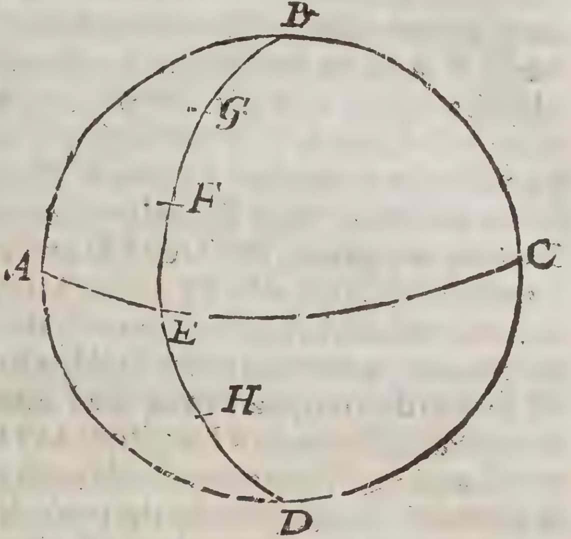
Of places differing onely in Longitude, there may bee three caſes: For 1. they may be vnder the ſame Parallell, as the Iland of Saint *Thomas*, and *Summatra*, which lie directly vnder the Equatour; or *Noremberg* and *Hamberg*, which hauing very neere the ſame Latitude, differ in Longitude, and lie in the ſame Parallell without the Equatour. 2. They may be vnder the like Parallels, that is, in points equidiſtant from the Equatour. As *Siene* in *Egypt*, vnder the Tropicke of *Cancer*; and *Beach* in the South continent, vnder the Tropicke of *Capricorne*. 3. They may be vnder the ſame Parallell and Meridian, but in oppoſite points of the ſaid Parallell: ſuch as are the *Periœci*, ſpoken of in the 10. Chapter.

4 Places differing onely in *Longitude*, whoſe diſtance is here propoſed to bee ſought out, are ſeated in the ſame, or diuers *Hemiſpheares.*

5 In the ſame *Hemiſpheare*, when both places haue either Eaſterne or Weſterne *Longitude.* This againe may haue two caſes; for either the places are vnder the *Equatour*, or without it: in both which, the finding out of the diſtance ſhall bee opened in theſe Rules.

1 *If two places vnder the Equatour in the ſame Hemiſpheare, differ in longitude: let the leſser longitude be ſubtracted from the greater, and the difference conuerted into Miles, and the diſtance will be knowne.*

As for example, wee will ſuppoſe of two places, whoſe diſtance is to bee ſought out, the former to be the Iland of Saint *Thomas* in *Africa*, the other the Iland *Summatra* in the *Eaſt Indies*, both ſituate directly vnder the *Equatour*; and therefore differing onely in Longitude. To expreſſe which, in this figure, let the firſt *Meridian* from which the Longitude is to be meaſured, be ABCD: the place where Saint *Thomas* Iland is ſeated, K: and the place of *Summatra*, F. Thẽ ſubtracting A K, the Longitude of Saint *Thomas* Iland, being leſſer, out of the Longitude of *Summatra* A E, the reſidue K E will ſhew the diſtance in degrees: which being multiplied by 60, and ſo conuerted into *Italian*-miles, will ſhew how many miles the ſaid places are diſtant the one from the other. As in this preſent example, wee finde the Longitude of Saint *Thomas* Iland to bee 32 degrees 20 minutes of *Summatra*, to bee 131 degrees: The leſſer ſumme ſubducted from the greater; to wit, 32 degrees 20 minutes, out of 131; there will remaine 98 degrees 40 minutes: which being againe multiplied by 60, will produce 5920 *Italian*-miles, the true diſtance betwixt the ſaid places.



2 *Of two places in the ſame Hemiſpheare, ſituate without the Equatour; the diſtance may be knowne two wayes: either by the reſolution of the Sphericall Triangle, or elſe by ta-*

bles.

bles of the miles anſwerable to the degrees of Latitude.

The former way is performed in this manner: Let the Triangle of two equall ſides F B G in the figure before, bee reſolued; in which the two equall ſides F B, and G B are the complements of equall Latitudes; to wit, A F, and E G. The Angle F B G is the difference of Longitude, which Angle, whether it bee a *Right Angle*, or *Oblique Angle*, will eaſily bee knowne, if by letting a perpendicular line B I from B to I it bee parted into two Triangles F B I and I B G: for becauſe thoſe two Triangles according to the grounds of *Geometry* are equall; the Arch I G in the Triangle I B G being found out, the Arch alſo I F in the Triangle F B I will alſo bee knowne: which being thus demonſtrated, wee muſt proceed in this manner, according to the Golden Rule. As the Right angle B I G is to the complement of the Latitude B G, ſo is I B G the middle difference of Longitude to I G the middle diſtance: *Pitiſcus* in his *Trigonometry* to this addes another manner of demonſtration, expreſſible by the precedent figure: let the perpendicular I B be continued vnto K, that B K may make a whole Quadrant. Now will the Triangle IHK haue Right Angles at I and K, at I by ſuppoſition, at K by his 57 propoſition demonſtrated in his firſt booke: becauſe, *If a greater circle of the Spheare paſſe by the Poles of a greater circle, it will cut it at right Angles, and contrariwiſe*: wherefore the ſides I H and K H muſt bee quadrants: becauſe, as hee ſhewes in his 68 propoſition of his firſt booke; *In a ſphericall Triangle hauing more then one Right Angle, the ſides ſubtending thoſe Right Angles are Quadrants*: Finally, becauſe the Arches G H and E H, are the complements of the Arches I G and KE: by the 9 definition of the firſt booke, *For as much as of any Arch leſſe then a Quadrant, the complement is that which wants to make it vp 90 parts*. We may by the helpe of the 57 proportion of his firſt booke, ſeeke out the complement of the third ſide G H; which will be the Arch G I: which will ſhew vs the probleme which wee ſought, by redu-

cing

ducing it vnto the Table of ſignes, and Tangents, exactly ſe out by our forenamed Author and others. For an example of this, wee may take two famous cities of *Germanie*, *Noremberg* and *Hamberg*, which without any ſenſible difference haue the ſame *Latitude*, but differ in *Longitude*: For the Longitude of *Noremberg* is 31 degrees 45 minutes: of *Hamberg* 32 degrees 30 minutes: the difference of Longitude then is 0 degrees 45 minutes. Theſe things ſuppoſed to be knowne, we will imagine *Noremberg* to be in F, *Hamberg* in G: and therefore A F, or E G will haue 49 degrees 23 minutes: F B or G B will haue 40 degrees 37 minutes: F B G or A E will haue 0 degrees 45 minutes: K E 0 degrees 22½ minutes: E H 89 degrees 37½ minutes: if we worke by the Table of *Signes*, *Tangents*, and *Secants*, the knowledge whereof is required to this Probleme. But becauſe the former way may ſeeme difficult to ſuch as are not much acquainted with *Trigonometry*, ſome haue ſet downe an eaſier way, depending on the vſe of a Table, wherein is calculated the number of miles anſwering to euery degree of euery Parallell of the Spheare: in which working, we ought to bee directed by this Rule: *If two places without the Equatour differ in longitude only, ſubtract the leſſer number out of the greater, and multiply it by the number of miles anſwerable to a degree of that Parallell, and the product will giue the diſtance.* As for example, if you would know the diſtance betwixt *London* and *Antwerpe*, which haue in a manner the ſame Latitude, but differ in Longitude: I finde them to differ in Longitude by 6 degrees, which number being multiplied by 37 miles anſwerable to 51 degrees of Latitude, theſe will ariſe to 247 miles, and 54 ſeconds of a mile.

A Table of Miles anſwerable to one Degree of euery ſeuerall Latitude.

1			2			3			4			5			6		
D	M	S	D	M	S	D	M	S	D	M	S	D	M	S	D	M	S
1	59	59	16	57	41	3	51	26	46	41	41	61	29	5	76	14	31
2	59	58	17	57	23	32	50	53	47	40	55	62	28	10	77	13	30
3	59	55	18	57	4	33	50	19	48	40	9	63	27	14	78	12	28
4	59	51	19	56	4	34	49	45	49	9	22	64	26	18	79	11	27
5	59	4	20	56	23	35	49	9	50	38	34	65	25	21	80	10	25
6	59	40	21	56	1	36	48	32	51	37	46	66	24	24	81	9	23
7	59	33	22	55	38	37	47	55	52	36	56	67	23	27	82	8	21
8	59	25	23	55	14	38	47	17	53	36	7	68	22	29	83	7	19
9	59	16	24	54	49	39	46	38	54	35	6	69	21	30	84	6	16
10	59	5	25	54	23	40	45	58	55	34	25	70	20	31	85	5	14
11	58	54	26	53	6	41	45	17	56	33	33	71	19	32	86	4	11
12	58	41	27	53	28	42	44	35	57	32	41	72	18	32	87	3	8
13	58	2	28	52	59	43	43	53	58	31	48	73	17	33	88	2	5
14	58	13	29	52	29	44	43	10	59	30	54	74	16	32	89	1	3
15	57	57	30	51	58	45	42	26	60	30	0	75	15	32	90	0	0

6 The diſtance of places differing only in Longitude in diuerſe Hemiſpheares is found out by this rule.

1 *Let the greater longitude be ſubtracted from the whole circle, and vnto the reſidue added the leſſer longitude, there will ariſe the diſtance betwixt thoſe places.*

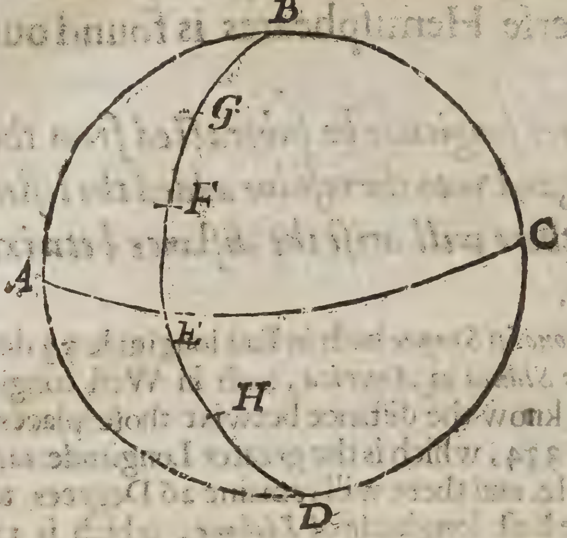
As for example, *Lisbone* in *Spayne* hath in Eaſt longitude 13 degrees: and *Cap de Los Slanos* in *America*, hath in Weſt longitude 334 degrees: to know the diſtance betwixt thoſe places, you muſt firſt ſubduct 334, which is the greater Longitude out of 360 the whole circle, and there will remaine 26 Degrees, to which if wee adde the Eaſt longitude of *Lisbone*, which is 13 degrees, it will make 39 degrees, which is the true difference of thoſe longitudes: which being multiplied by the Number of miles in the Table going before, anſwerable to the latitude of the ſaid places (if they differ only in longitude) there will ariſe the number of miles contained in the Diſtance.

7 Diſtant places which differ onely in *latitude*, are ſuch as lye vnder the ſame *Meridian*, but diuerſe *Parallells*: Theſe are ſuppoſed to be either in *One*, or in *Diuerſe* latitudes or Hemiſpheres.

8 In *One*, when both the places haue either North latitude, or both South Latitude: The finding out of which diſtances depends on theſe Propoſitions.

1 *If the latitude of each place be towards the ſame Pole, ſubtract the leſſer from the greater latitude, and the reſidue conuert into miles.*

The reaſon may bee explained in this Figure : wee will imagine E F to bee the leſſer, E G the greater latitude. There will remaine an Arch of the Meridian F G : which being multiplied by 60 (being part of a great circle, will make the nũber of miles anſwerable, to that diſtance. For an example we will take two Citties of England, *Oxford* and *Yorke*. The latitude *Oxford*, we take to be 31 degrees 30 minutes: of *Yorke* 54 degrees 30 minutes. The leſſer latitude ſubtracted from the greater, there will remaine three degrees, which being multiplied by 60, will render 180 *Italian*-miles, the Diſtance of thſe two places.



2 *If two places in latitude only diſtant, be ſituate in diuerſe kindes of latitude, adde the latitude of the one to the other, and the whole ſumme ſhall be the diſtance.*

As for example, in the former Diagram, imagining as in the former caſe B D to be the Meridian of thoſe diſtant places, and A C the Equatour, we will ſuppoſe the one place to bee ſituate towards the North Pole, as G, the other towards the South, as in H: then as appeares by ſenſe, will the diſtance bee the Arch of the Meridian G H, whereof G E, and E H, are parts, whereof it is compounded: wherefore it muſt needs follow that thoſe parts added together make the whole diſtance: for example we will take *Bellograde* in *Europe*, and the *Cape of good hope* in *Africa*, which haue neere the ſame longitude, to wit, 48 degrees 30 minutes: but they differ in latitude in ſuch ſort, as the former hath of the Northerne latitude 44 degrees 30 Minutes; the other of Southerne latitude about 35 degrees 30 minutes. Theſe two numbers added together, will make 80 degrees, which being multiplied by 60 will produce 4800 miles the diſtance of thoſe places.

9 Hitherto of the diſtances of places which are *Vniforme*, that is to ſay, of ſuch as differ either only in *longitude*, or onely in *latitude*: wee are next to conſider of ſuch diſtances as are *various*, wherein the places differ both in *longitude* and *latitude*.

10 The Inuention of ſuch a diſtance, may bee performed two wayes, either *Abſtractiuely* by the reſolution of *Triangles*, or elſe *Mechanically* by inſtruments. The former againe may bee two wayes, either by the *Right-line* Triangle, or by the *Sphericall*: The inuention of the diſtance by the *Rigt-line* Triangle depends on theſe following Propoſitions declaring two wayes of inuention.

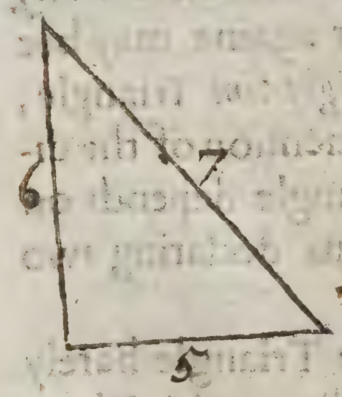
11 The firſt is by a Rectangle Triangle barely conſidered by it ſelfe, according to this Theoreme.

1 *The ſquare Root of the number made of the differences of longitude and latitude of two places diſtant, will ſhew the diſtance of thoſe places.*

The ground of this Propoſition is taken from the 27 Propoſition

of

of the firſt booke of *Euclide*: where it is demonſtrated that the ſquare of the Hypotenuſa, or greateſt ſide of a Rectangle Triangle is equall to the two ſquares made of the two other ſides: which being well vnderſtood, will lend an eaſie light to this propoſition. To performe which we muſt firſt take the difference of longitude, which is imagined to make one ſide of this Triangle. Then wee muſt obſerue alſo the difference of latitude, which is ſuppoſed to make another ſide. Then are we ſure by the former Propoſition of *Euclide* that the ſquares of theſe two ſides, are equall to the ſquare of the *Hypotenuſe*, or third ſide; which is to be ſought out, and expreſſes the diſtance betwixt thoſe places: wherfore we muſt firſt multiply theſe two ſides in themſelues, whence they will become ſquares. 2. We muſt adde them together. 3 We muſt out of the totall extract the quadrat root, which will ſhew the diſtance: as ſuppoſe according to this Figure, two Cities diſtant and differing both in longitude and latitude: wherof the one ſhall haue in longitude 21 degrees, in latitude 58: the other is ſuppoſed to haue in longitude 26 degrees, in latitude 52. Here firſt I ſubtract the leſſe longitude out of the greater, to wit, 21 out of 26, and the reſidue will bee 5, which I ſuppoſe to be one ſide of the Rectangle Triangle. Then likewiſe I ſubtract the leſſe latitude as 52 out of 58, the reſidue will be 6, which I make the other ſide of my Triangle, which done, I multiplie 6 in it ſelfe, and it makes 36, which is the ſquare of one ſide: Then I multiply 5 in it ſelfe, and the product will be 25, the ſquare on the other ſide. Theſe two ſquares added together by the foreſaid Propoſition muſt be equall to the ſquare of the *Hypoteneuſ*, or third ſide 61, whereof the ſquare root being extracted, will ſhew the ſide it ſelfe, which will be $7\frac{7}{15}$ which is the diſtance: If any man deſire to know this diſtance according to miles, he muſt reduce the degrees of longitude and latitude into miles according to our former rules, before he begin to worke:



becauſe (as wee haue ſhewed) the degrees of longitude being meaſured in the Parallells are not alwayes equall, the Parallels being ſomewhere greater, ſomewhere leſſer. This way muſt needs bee more exact, in that a Mile is a ſmaller part then a Degree, and (as *Pitiſcus* notes) the Fractions which fall out in extraction of roots can hardly bee reduced to any proportion. Neuertheleſſe this way of finding out the diſtance by a Right-line Triangle, howſoeuer common and receaued, is very vnperfect and ſubiect to great errour, eſpecially in places far diſtant: for as much as it ſuppoſeth the Meridians with the Parallels on the Globe to make true ſquares, whereas indeed all the Meridians meet in the pole, and ſo by conſequence cannot make true ſquares: But yet this errour is far leſſe in a leſſer diſtance; becauſe in a ſmall ſpace of earth, the roundneſſe and conuexity of the Earth is inſenſible, or at leaſt of very ſmall importance: ſo that this way cannot be altogether vnuſefull.

12 Another is found out more exact then the former by the tables of *Signes*, *Tangents*, and *Secants*. This is performed by finding out the numbers: whereof the former is called *Inuentum primum*, or the firſt found number. The ſecond *Jnuentum ſecundum*, or the ſecond found number. The working of which Probleme depends on theſe rules.

1 *Multiply the Right Signe of the difference of the longitude into the ſumme of the complement of the leßer latitude, and diuide the product of that multiplication by the totall ſumme, & then by the rules of* Signes *and* Tangents *the Arch of that Quotient found out will giue the* firſt found *number.*

2 *Multiply the right ſigne of the leßer latitude by the totall ſigne, and hauing diuided the product thereof by the ſigne of the complement of the firſt number, ſubtract the Arch of that quotient out of the greater latitude which giues the* ſecond found *number.*

3 *Then multiply the ſigne of the complement of the firſt found number into the ſigne of the complement of the ſecond found number, and hauing diuided the product by the Totall Signe, Let the Arch of the quotient be ſought out by the Tables, which Arch ſubtracted out of the whole quadrant, will giue the degrees of a diſtance in a great circle.*

To expreſſe the practice and manner of working according to our former Rules, we will ſuppoſe the two cities, whoſe diſtance is here ſought out to be *Jeruſalem* and *Norimberge* in *Germany*. *Jeruſalem* hath in longitude 66. degrees. 0. min. and in latitude 31 degrees, 40. minutes. Againe *Norimberge* hath in longitude 28. degrees. 20. minutes, and in latitude 49 deg. 40. min. The difference of their longitude is 37. deg. 40. minutes. The right ſigne whereof is 36664: (for here wee make 60000 to be the totall ſigne, rejecting the two laſt figures on the right hand in the tables of *Regiomontanus*.) Now you muſt multiply 36664: into the ſigne of the Complement of the leſſer latitude, which is 51067: the product of which two ſignes being multiplied the one by the other, there will ariſe 1872320488 which if you diuide by the totall ſigne 60000, the quotient will giue you 31205, whoſe Arch is 31 deg. 20 min. and this muſt be your firſt found Number.

For the finding of the ſecond Number, you muſt proceede in this mãner: Multiply the right ſigne of the leſſer latitude, which is 31498 by the totall ſigne 60000, and the product will bee 1889880000: which ſumme, if wee diuide by the ſigne of the Complement of the *firſt-found* Number, which is 51249, wee ſhall finde in the quotient 36876; the Arch whereof is 37 degrees, 55 min: which Arch ſubtracted out of the greater latitude, there will remaine 11 degrees, 29 min: and this is our *ſecond-found* Number. Theſe things thus ſuppoſed to bee found out, wee muſt multiply the fore-ſaid ſigne of the Complement of the *firſt-found* Number, which is 58798, and the product will ariſe to 3013338702, the Arch whereof is 56 deg. 50 min: which being ſubtracted out of the whole quadrant, viz: 90 degrees, there will remaine 33 degrees, 10 min: of the greater circle. Theſe 33 degrees if we multiply by 60, there will ariſe 1980 miles, whereunto if we finde the 10 miles anſwerable to the 10 min. wee ſhall finde the diſtance betwixt theſe places to be 1990 Italian-miles. This example is vſed by *Appian*, and wrought according to his owne Tables, and farther explained by our countryman *Blundeuill* in his Exerciſes. The ſame way of working hath been deliuered by *Clauius*, *Junctinus*, and others, although not according to the ſame Tables. This way of meaſuring the diſtance by the *Signes* and *Tangents* according to theſe Authors, may be warranted more exact than the other, becauſe it admits of ſmaller parts in the calculation; yet will it come far ſhort of truth.

10 Another way of finding out the Diſtances of places, differing both in longitude & latitude, is by the Reſolution of a Sphericall triangle.

This way of all the reſt muſt needs be moſt certaine: for as much as this kind of triangle beſt expreſſeth the ſections of the Globe. The methode of which working I finde no-where better taught then in *Pitiſcus* his *Trigonometry*: of whoſe ingenious induſtry notwithſtanding little vſe can bee made, except the Learner firſt acquaint himſelf with his principles, becauſe in his *Geographicall Problemes*, he briefely referres his Reader to his former grounds and *Axiomes*, accurately demonſtrated in his former books: For mine owne part it might perhaps ſeeme as abſurd in this Treatiſe,

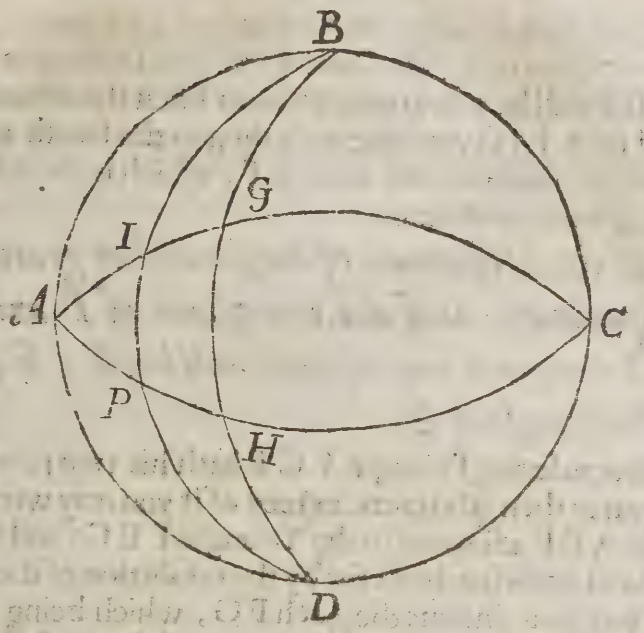
tiſe, to intermixe all his preparatory demonſtrations, being meerely *Geometricall*, and without the limites of my ſubject, as by leauing out ſo neceſſary a way to mangle my diſcourſe. Wherfore intending a middle way, I will (God-willing) in ſuch ſort ſet downe theſe propoſitions, that I may giue ſome light to this excellent inuention, and referre my Reader to *Pitiſcus* his *Axiomes* for farther Demonſtration.

14 The Diſtances propoſed to be meaſured by Sphericall triangles, admit of two caſes: 1 When two places are ſo ſituate, that the one is vnder the *Equatour*, the other without. Secondly, when both are without the *Equatour*.

15 The former againe is three-fold: For either the difference of longitude betwixt thoſe places is *Equall* to a quadrant, or *Leſſe*, or *Greater*. The ſeuerall wayes of inuention ſhall bee directed by theſe Rules.

1 *If the Difference of longitude be Equall to a quadrant, the diſtance will alſo be a quadrant.*

As for example in this preſent figure wee will imagine the circle A B C D to bee the firſt Meridian: the places whoſe diſtance is ſought out A and G: whoſe Diſtance A G will bee a quadrant. For A will be a pole of a Greater Circle B G D, by the 56 prop. of the 1 of *Pitiſcus*: wherefore all the Arches drawne from thence to B G D will bee quadrants by the ſame propoſition. For a more familiar inſtance wee will take the Iland *Sumatra*, which hath in longitude 131 degrees, but no latitude, being ſited vnder the Equatour: and the city *Buda* the *Metropolis* of *Hungary*, which hath in longitude 41 degrees, in latitude 47 degrees; The difference of longitude is 90 degrees; for 41 be-



ing ſubducted out of 131, there will remaine 90, wherefore the diſtance betwixt thoſe places will be 90, which being multiplied by 60, will produce 5400 Italian-miles.

2 *If the difference of longitude bee leſſe then a quadrant as A F: the Triangle A E F here is to bee reſolued into his parts, according to the 4th Axiome of* Pitiſcus.

As for example the places, whoſe longitude is here ſought out, ſhall be A and F; The Triangle here to be knowne is AEF; whoſe Reſolution depends on our Authors 4th Axiome. For the Difference of longitude is A B F; becauſe the meaſure of a Sphericall Triangle being taken in a great circle, is an Arch of a greater circle, deſcribed from the Angular point, and comprehended betwixt the two legges of the Triangle ſo farre as a quadrant, as is taught in the 58 propoſition of his firſt Booke. For a more ſpeciall inſtance we will take two places; whereof the one ſhall bee the Iland of S. *Thomas* before mentioned, which hath in longitude 32 degrees and 20 minutes. The other *Amſterdam* in *Hol-*

land, which hath in longitude 26 degrees, 30 minutes. The former we imagine in A; the later in F. The Difference of longitude A B F will be 5 degrees, 50 min: Then the diſtance ſought out muſt be A F: ſo working according to the fourth Axiome of *Pitiſcus*, we ſhall find the Arch A F, which is the diſtance, to be 54 degrees, 19 minutes.

3 *If the Difference of longitude bee greater then a quadrant, as of the two places of F and C, the Triangle to bee reſolued will bee F C E, being a Rectangle at E.*

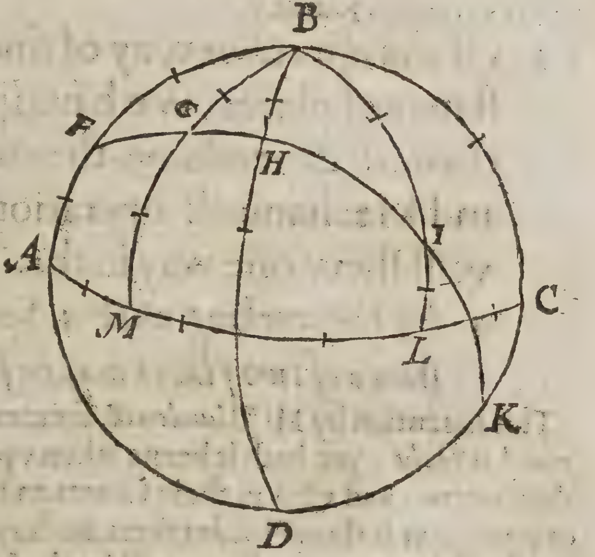
Here becauſe the Triangle F C E hath his two ſides F C, and E C, greater then quadrants, inſteed of it you may worke on the Triangle A E F, adioyned to the Triangle F E C: and the whole worke will be diſpatched: for by the reſolution of the Triangle A E F, you ſhall find out the Arch F G, which being added to the quadrant C G, there will be produced the Arch F C, which is to be ſought out. As for example, we will imagine *Heidelberge* as it were placed at F, to haue in longitude 30 degrees, 45 minutes, in latitude 49 degrees 35 min: Then wee will ſuppoſe *Summatra*, as placed at C, to haue in longitude 131 degrees, but no latitude: The difference of longitude will be E C, of 100 degrees, 15 minutes: and the complement A E 79 degrees, 45 minutes. Then working according to the Rules of *Trigonometry*, we ſhall find the ſigne of the Arch F C, to be 6 degrees, 37 $\frac{1}{2}$ minutes; which being added to F C, being 90 degrees, will produce 96 degrees, 37 $\frac{1}{2}$ minutes, to which Arch there will anſwer 1449 German-miles.

16 The ſecond Caſe is, when both places are ſituate without the Equatour: This is againe twofold: For either the two places are vnderſtood to be ſituate towards the ſame Pole, or elſe one place toward the Northerne, the

other towards the Southerne Pole. Both which Caſes ſhall be taught in theſe Rules.

1 *If both places whoſe diſtance is ſought, be ſituate towards the ſame Pole, there will ariſe a Triangle, whoſe ſides and Angles will be knowne by the fourth Axiome of* Pitiſcus *in Trigonometry the fourth Booke.*

As for example, in this preſent figure, let the two places giuen bee F G, the Triangle to bee knowne, will be F B G, whoſe acute Angle will be at B. Let the places giuen bee as F H; the Triangle to bee reſolued & known will bee F B H, hauing a right Angle at H. Finally, if the places ſuppoſed to be giuen, are as F I, the Triangle to bee knowne will bee F B I, with an obtuſe Angle at I.



2 *If the one place be ſituated towards the North-pole, and the other towards the South-pole, there will ariſe a Triangle, whereof the one ſide about the Angle which is giuen, will be greater then a quadrant.*

As in the former figure, let the places giuen be as G and K, alſo H and K, alſo I and K: There will ſtill fall out a Triangle, whoſe one ſide containing the Angle giuen, will be greater then a quadrant, as B K: wherefore for the ſide B K, you muſt take his complement to the Semi-circle B F, that is, for the Triangle G B K, you muſt worke by the Triangle G B F: and inſteed of the Triangle H B K, you muſt take the Triangle H B F: and for the Triangle I B K, you muſt worke by the Triangle I B F, according to the fourth Axiome of the fourth booke of *Pitiſcus*, to which I had rather referre my Reader, then intermixe our *Geographicall* diſcourſe with handling the Principles of *Geometry*, which here are to be ſuppoſed ſo many precedent propoſitions; which, expreſſed as they ought, would tranſcend the bounds of my intended journey.

17 Of the *Aſtractiue* way of finding out the Diſtance of places, we haue ſpoken: The *Mechanicall* depends on the vſe of Inſtruments and Mechanicall operation, whereof wee will ſhew one way in this Theoreme.

1 *By the working with a Semi-circle, the Diſtance of two places may be found out.*

This inuention by Mr *Blundeuill*, ſeemes to be aſcribed to *Edward Wright*, yet hath it beene taken vp of forreine Writers as their owne, and vſed in their Charts and Mappes. The manner of operation is thus: Firſt, let there be drawne a ſemi-circle vpon a right *Diameter* ſigned out, will be the letters ABCD, whereof D ſhall be the center, as you find it deciphered in this preſent figure. The greater this *Semi-circle* be made, ſo much the more eaſie will be the operation; becauſe the degrees will be larger. Then this *Semi-circle* being drawne, and accordingly diuided, imagine that by the helpe of it, you deſire to find out the diſtance betwixt *London* and *Jeruſalem*, which cities are knowne to differ both in *longitude* and *latitude*. Now, that the true diſtance betwixt theſe two places may bee found out, you muſt firſt ſubtract the *leſſer longitude* out of the *greater*, ſo ſhall you finde the

Difference of their longitudes, which is 47 degrees. Then reckon that Difference vpon the *Semi-circle*, beginning at A, and ſo proceed to B; and at the end of that Difference, make a marke with the letter E, into which point by your Ruler, let a right line be drawne from D the center of the *Semi-circle*. This being in this ſort performed, let the leſſer latitude be ſought out, which is 32 degrees in the foreſaid *Semi-circle*, beginning your accompt from the point E, and ſo proceeding towards B, and at the end of the leſſer *latitude*, let another point bee marked out with the letter G: from which point let there be drawne a perpendicular, which may fall with right Angles vpon the former line, drawne from D to E; and where it chanceth to fall, there marke out a point with the letter H: This being performed, let the greater *latitude*, which is 51 degrees, 32 minutes, be ſought out in the *Semi-circle*, beginning to reckon from A towards B, and at the end of that latitude, ſet downe another point, ſigned out by the letter I: from whence let there bee drawne another perpendicular line, that may fall with right Angles vpon the *Diameter* A C, and here marke out a point with the letter K: This done, take with your Compaſſe the diſtance betwixt K and H; which diſtance you muſt ſet downe vpon the Diameter AC, placing the one foote of your compaſſe vpon K, and the other towards the center D, and there marke out a point with the letter L: Then with your compaſſe take the ſhorter perpendicular line G H, and apply that wideneſſe vpon the longer perpendicular line I K, placing the one foot of your compaſſe at I, which is the bounds of the great *latitude*, and extend the other towards K, and there make a point at M. Then with your compaſſe take the diſtance betwixt L and M; and apply the ſame to the ſemicircle, placing the one foot of your compaſſe in A, and the other towards B, and there marke out a point with the letter N. Now the number of degrees comprehended betwixt A and N, will expreſſe the true diſtance of the two places, which will be found to be 39 degrees: which being multiplyed by 60, and ſo conuerted into miles according to our former Rules, will produce 2340, which is the diſtance of the ſaid places.

17 The *expreſſion* of the Diſtance of two places may be performed either by the *Globe* or *Map* according to theſe Rules.

1 *The diſtance betwixt two places in the Globe, being obſerued by the quadrant of Altitude, and applied to the degrees of the Equatour, or any great circle, will ſhew how many miles ſuch places are diſtant.*

The practiſe hereof is very eaſie, as ſhall be taught in this example: we wil for inſtance take *Tolledo* in the middeſt of *Spaine*, and the *Cape of Good Hope* in the *South* Promontory of all *Africa*: The ſpace taken by a quadrant of Altitude, or any threed applyed to the *Equatour*, will be found to bee about 82 degrees, which being multiplyed by 60, and ſo conuerted into miles, will render 4920, the true diſtance betwixt theſe two places.

2 *The diſtance betwixt any two places in the* Chart, *obſerued by a compaſſe, and applyed to the degrees of a greater Circle, will ſhew how many miles ſuch places are diſtant one from the other.*

For an example, we will take the city *Seuill* on the *Southmoſt* part of *Spaine*, and *Bilbao* on the *North*-ſide: the ſpace betwixt thoſe places being taken with a threed or a compaſſe, and applyed to one of the greater Circles, will containe about 6 degrees; which being multiplyed by 60, and ſo conuerted into *Italian*-miles, will produce 360: and ſo many miles thoſe Cities are to be eſteemed diſtant the one from the other.

The end of the firſt Booke.

GEOGRAPHIE
THE SECOND BOOKE.

CONTAINING
the generall Topicall
part thereof,

By NATHANAEL CARPENTER, Fellow of
Exceter Colledge in Oxford.

GENES. 1. verſ. 10.
And God called the Dry-land, Earth; *and the gathering together of the* waters *called the* Seas: *and God ſaw that it was* good.

OXFORD,
Printed by *John Lichfield*, for *Henry Cripps*, and are to be ſold by
Henry Curteyne. Anno Domini, M. DC. XXXV.

TO THE
RIGHT HONOVRABLE
PHILIP,
EARLE OF
MOVNTGOMERIE &c.

Knight of the moſt Noble order of the
Garter, and Steward of the famous
Vniuerſity of Oxford.

Right Honourable,

THis *Geographicall* Treatiſe conſiſting of two parts, was in the very birth in ſuch ſort conſecrated to your ineſtimable *Brother* as notwithſtanding it ſo far reſerued it ſelfe to awaite your *Honours* fauour, that *Both* may ſeeme, as to ſhare a *part*, ſo to challenge the *whole* in my poore *Induſtrie.* The *Soule* of *man* which ſome Philoſophers imagine, to be *all* in *all*, & *all* in euery *part*, ſeemes to me no where better reſembled then in your Generous *Fraternity*; wherein the *Soule* of *Heroicall Magnificence*, though *Indiuided* in it ſelfe, ſo *entirely* communicates herſelfe to either, that both may ſeeme at once to *enioy* her preſence while neither *want.* If this my bold attempt in preſenting to your *Honours* hands theſe vnworthy labours, without any former reference, might be interpreted intruſion, it were enough for *Ingenuity* to pretend, that your generous loue vnto our poore *Colledge* and the reſpectiue duty wherein the *Colledge* alwayes ſtands obliged vnto your *Honour*, commands my pen beyond *manners* or *ability.* Your affection to our *houſe*, could no way expreſſe it ſelfe ampler then by truſting our cuſtody, with the charge of your choiceſt Iewell: A *Gentleman* of that towardly *wit* and ſweet *diſpoſition*, that *Learning* and *Morality* commonly reputed the daughters of *time*, ſeeme in him ſcarce beholding to *yeeres*, and to challenge a precedency before *experience*; in ſo much that our ancient *Mother* markt out with all the Characters of *age* and declining *weakeneſſe*,

R. L^{d}. D.

cheriſhing in her boſome this young darling, ſeemes to reſume her *youthfull* habit, and triumph ouer *Time* and *Ruines.* This happines amongſt diuerſe others vouchſafed by your Honour to the place, for whoſe good opinion the beſt part of mine endeuours ſtand engaged, hath encouraged my *hopes* to promiſe me your indulgent Acceptance of this ſlender piece, long ſince intended and deuoted, as my ſelfe, vnto your ſeruice: In which confidence, fearing any longer to treſpaſſe on your ſerious and high imployments *endebted* to your King and Countrey, I humbly reſt

Your Honours in all duty and
ſeruice to bee commanded

NATHANAEL CARPENTER.

A TABLE OF THE SEVERALL Contents of the ſecond Booke of Geography, according to the ſpeciall Theoreme.

CHAP. I.

Of Topography and the Nature of a place.

1 *THe Terreſtriall Spheare is euery-where habitable.* pag. 4
2 *All places of the Earth haue ſuffered manifold mutation and changes, as well in name as nature.* pag. 6
3 *Places hauing long continued without habitation, are ſeldome ſo healthy and fit for dwelling, as thoſe which haue beene inhabited.* 11

CHAP. II.

Of the generall Adiuncts of places.

1 *The manner how to meaſure the magnitude of a Region by the Diameter, both according to breadth and length.* 15
2 *Of the meaſuring of a Countrey by the circuite of it.* 17
3 *The Meaſuring of a Countrey by the circuite is deceitfull, and ſubiect to great errour.* 17
4 *Thoſe Regions are more exactly meaſured which partake of a plaine ſurface.* 19
5 *How Countries are bounded.* 20
6 *Naturall bounds are more certaine then Artificiall.* ibid.

7 Equall

7 *Equall bounds containe not alwaies equall Regions.* 21
8 *Of the quality of a Region.* ibid.
9 *Speciall places are endowed with ſpeciall Tempers and diſpoſitions.* 21
10 *Of the magneticall affections of a place, as Variation and Declination.* 26
11 *The magneticall variation is of no vſe for the firſt finding out of the longitude: yet may it ſerue to good purpoſe for the recognition of a place before diſcouered.* 27
12 *The declination of a place being knowne, the latitude may bee found, yet not without ſome errour.* 29
13 *Of the externall Adiuncts of the Aire belonging to a place.* ibid.
14 *The diſpoſition of the Aire Adiacent to a place depends chiefly on the Temperament of the ſoile.* 30

CHAP. III.

Of the Adiuncts of a place in reſpect of the heauens.

1 *Places according to their diuerſe ſituation in regard of the Heauens are diuerſely affected in quality and conſtitution.* 34
2 *Of the diuiſion of the Earth into the North and South Hemiſpheares.* 38
3 *Northerne and Southerne places alike ſituate generally enioy a like diſpoſition.* 39
4 *The Northerne Hemiſpheare is the maſculine, the ſoutherne the fœminine part of the Earth.* 40
5 *Of the diuerſe ſections of the Hemiſpheares and the ſeuerall qualities belonging to them.* 43
6 *Of the Eaſt and Weſt Hemiſpheares.* 51
7 *The Eaſterne Hemiſpheare is happier then the other.* 52
8 *The difference of the Eaſt and Weſt cannot worke any difference in two places, by any diuerſity of the heauens.* 53
9 *Of the ſubdiuiſiou of the Eaſterne and Weſterne Hemiſpheares.* 54
10 *Places ſituate towards the Eaſt in the ſame latitude are better then thoſe places towards the Weſt.* ibid.

CHAP.

CHAP. IV.

Of the manner of Expreſſion and Deſcription of Regions.

1 *Of the finding out of the Angle of poſition by ſome dioptricke Inſtrument at two or more ſtations.* 57
2 *At one ſtation by opticall obſeruation to find out the ſituation of one place in reſpect of the other.* 59
3 *Of the manner of tranſlation of Regions into the Chart.* 61
4 *To ſet downe the Meridians and Parallels in a particular Chart.* 62
5 *How to ſet downe Cities, Caſtles, Mountaines, Riuers, &c. in the Chart.* 64
6 *Of the fabricke of the ſcale of miles in the Chart.* 65
7 *The vſe of the ſcale of miles ſet downe in the Chart.* *ibid.*

CHAP. V.

Of Hydrography, and the abſolute adiuncts of the Sea; of the figure and quality.

1 *Although the whole body of the water be ſphericall, yet it is probable, that the parts of it incline to a Conicall figure.* 70
2 *The water of the ſea is ſalt, not by Nature but by Accident.* 75
3 *Seas abſolutely ſalt, are neuer frozen.* 79
4 *The Water of the ſea is thicker then the other Water.* 80

CHAP. VI.

Of the motions of the ſea.

1 *Of the ebbing and flowing of the ſea and the cauſes thereof.* 82
2 *All ſeas doe not ebbe and flow alike, nor the ſame at all times.* 92
3 *It is probable that the ſea is carried ſome-where from Eaſt to Weſt, and ſome-where from North to South, & contrariwiſe.* 98
4 *Of the violent motion of the ſea cauſed by windes.* 101
5 *To ſome certaine places at certaine times belong certaine winds.* 102
6 *The violence of the winds makes the ſea ſometimes in ſome places tranſcend his ordinary bounds.* 103

CHAP.

CHAP. VII.

Of the Depth, Situation, and Termination of the ſea.

1 *The ordinary depth of the ſea is commonly anſwerable to the ordinary height of the maine land aboue the water: and the Whirlepooles & extraordinary depths, anſwer to the height of the mountaines aboue the ordinary height of the Earth.* 104
2 *The ſuperficies of the ſea is ſome-where higher then the ſuperficies of the Earth: ſome-where lower.* 109
3 *The ſea in reſpect of the Earth is higher in one place then another.* 111
4 *The Water is ſo diuided from the dry-land, that the quantity of water is greater in the Southerne Hemiſpheare, of land in the Northerne.* 115
5 *The whole Globe of the Earth is enuironed round with ſea betwixt Eaſt and Weſt.* 116
6 *It is probable that the Earth is enuirnoed round with water from North to South: Of the North-weſt paſſage,* 117

CHAP. VIII.

Of Sea Trafficke and Merchandice.

1 *Nauigation firſt taught by Almighty God, was afterwards ſeconded by the induſtrie of famous men in all ages.* 132
2 *Nauigation is very neceſſary as well for the increaſe of knowledge as riches.* 135

CHAP. IX.

Of Pedography, Riuers, Lakes, and Fountaines in the Earth.

1 *All Riuers haue their originall from the ſea the mother of riuers.* 142
2 *All Riuers and Fountaines were not from the beginning.* 155
3 *Many riuers are for a great ſpace of land ſwallowed vp of the Earth: whereof ſome after a certaine diſtance, riſe againe.* 156
4 *Riuers*

4 *Riuers for the moſt part riſe out of great mountaines, and at laſt by diuerſe or one Inlet are diſburthened into the ſea.* 157
5 *Diuerſe Fountaines are endowed with diuerſe admirable vertues and operations.* 159
6 *Places neere great Riuers and Lakes, are moſt commodious for Habitation.* 162
7 *Of Lakes and their cauſes.* 162
8 *It is probable that ſome Lakes haue ſome ſecret intercourſe with the ſea vnder ground.* 163

CHAP. X.

Of Mountaines, Vallyes, plaine-Regions, woody and champion Countreyes.

1 *Mountaines, Vallyes, and Plaines, were created in the beginning, and few made by the violence of the Deluge.* 165
2 *The perpendicular height of the higheſt mountaines ſeldome exceeds* 10 *furlongs.* 169
3 *The ordinary height of the land aboue the ſea in diuerſe places is more then the hight of the higheſt mountaines aboue the ordinary face of the Earth.* 171
4 *Mountaines Countreyes are commonly colder then plaine.* 172
5 *Mountaines ſince the beginning of the world haue ſtill decreaſed in their quantity, and ſo will vnto the end,* 174
6 *Of Woods and their nature.* 178
7 *Woods are not ſo frequent or great as in ancient times.* 179
8 *Places moderately ſituate towards the North or South-pole, abound more in woods then neere the Equatour.* 180

CHAP. XI.

Of Ilands and Continents.

1 *It is probable that Ilands were not from the firſt beginning, but were afterwards made by violence of the water.* 184
2 *Peninſula's by violence of the ſea fretting through the Iſtmus, haue oftentimes turned into Ilands, and contrariwiſe: Peninſalas by diminution of the ſea made of Ilands.* 189

CHAP.

CHAP. XII.

Of Inundations and Earth-quakes.

1 *No vniuerſall Inundation of the Earth can be naturall: the other may depend from naturall cauſes.* 193

2 *Particular alterations haue happened to the bouds of Countries by particular Inundations.* 195

3 *Certaine Regions by reaſon of great Riuers are ſubiect to certaine anniuerſary Inundations.* 197

4 *Regions extreame cold or extreame hot, are not ſo ſubiect to Earth-quakes as places of a middle temper.* 201

5 *Hollow and ſpongie places are more ſubiect to Earthquakes then ſolide and compacted Soiles.* 202

6 *Ilands are more often troubled with earth-quakes then the continent.* 203

CHAP. XIII.

Of the Originall of Inhabitants.

1 *All Nations had their firſt originall from one ſtocke, whence afterwards they became diuided.* 206

2 *The firſt inhabitants of the Earth were planted in Paradiſe and thence tranſlated to the places adioyning.* 208

3 *The firſt plantation of Inhabitants immediately after the Deluge beganne in the Eaſt.* 213

CHAP. XIV.

Of the diſpoſition of Inhabitants in reſpect of the ſite.

1 *The people of the Northerne Hemiſpheare, as well in Riches, and Magnificence, as valour, ſcience, and ciuill gouernment, far ſurpaſſe the people of the ſouth Hemiſpheare.* 221

2 *The extreame Inhabitants toward the pole, are in complexion hot and moiſt: Thoſe towards the Equatour, cold and dry, thoſe of the middle partaking of a middle temper.* 226

3 *The*

3 *The extreame Inhabitants towards the poles are naturally enclined to Mechanicall works and martiall endeuours; the extreame towards the Equatour, to workes of Religion and Contemplation: The middle to lawes and ciuility.* 232
4 *The people of the extreame Regions towards the poles in Martiall proweſſe haue commonly proued ſtronger then thoſe neerer the Equatour: but the middle people more prouident then either in the eſtabliſhment and preſeruation of commonwealths.* 236
5 *The extreame Regions, in Manners, Actions, and Cuſtomes, are cleane oppoſite the one to the other: The middle partake a mixture of both.* 239
6 *The people of the Eaſterne Hemiſpheare in ſcience, Religion, Ciuility, and Magnificence, and almoſt in euery thing els, are farre ſuperiour to the Inhabitants of the Weſterne.* 250
7 *The Weſterne people haue beene obſerued to be more happy, and able in Martiall diſcipline; the Eaſterne in witty contemplation and contemplatiue ſciences.* 252
8 *The Eaſterne part of the Weſterne Hemiſpheare was peopled before the Weſterne.* 255

CHAP. XV.

Of the Diuerſity of diſpoſitions in regard of the Soile.

1 *Mountaine-people are for the moſt part more ſtout, warlike, and generous, then thoſe of plaine Countries, yet leſſe tractable to gouernment.* 256
2 *Windy Regions produce men of wild and inſtable diſpoſitions: But quiet Regions, more conſtant and curteous.* 273

CHAP. XVI.

Of the diſpoſitions of Inhabitants, according to their originall and education.

1 *Colonies tranſlated from one Region into another farre remote*

retaine

retaine a long time their firſt diſpoſition, though by little & little, they decline and ſuffer alteration. 278

2 *The mixture of Colonies begets the ſame Nation a greater diſparity and variety of the Nations amongſt themſelues.* 278

3 *Education hath a great force in the alteration of Naturall diſpoſitions: yet ſo as by accident remitted, they ſoone returne to their proper Temper.*

4 *By Diſcipline, Nations become more Wiſe and Politicke in the preſeruation of ſtates, yet leſſe ſtout and couragious.* 282

The Analyſis of the ſecond Booke.

- Topography cõtaining a deſcription of the Earth as it is diuided into places Chapter 1. is either
  - Generall, which of a place generally taken without any ſpeciall diuiſion handles the
    - Adiuncts & proprieties: theſe agree to a place in reſpect of the
      - Earth it ſelfe? which are Internall or Externall; Common or Magneticall, whereof Chapter 2.
      - Heauens: which are Generall or Speciall. Chap. 3.
    - Expreſſion and Manner of Deſcription of Regions, as well in the finding out the Angle of poſition, as Tranſlation of places formerly found out into the Globe or Chart. Chap. 4.
  - Speciall, which containes the diſtinction of a place into
    - Sea, whoſe deſcription is called Hydrography, in which wee are to conſider the Adiuncts of the Sea, which are either
      - Internall, which are inbred in the Nature of the Sea; which againe are either
        - Abſolute, ſuch as agree to the Sea without any compariſon of it with the Land: here wee obſerue in the water of the Sea
          - 1 The Figure, and Quality. Chap. 5.
          - 2 The Motion, Naturall and Violent. Chap. 6.
        - Comparatiue, which concerne the Depth, Situation, and Termination of the Sea. Chap. 7.
      - Externall, which concerne Sea-Trafficke and Marchandize. Chapter 8.
    - Land, which we terme Pedography, whoſe Accidents are either
      - Naturall, which are againe diuided into
        - Perpetuall, ſuch as ordinarily agree to the earth: theſe againe are either
          - Abſolute, wherein wee haue no reſpect vnto the ſea: Herewe conſider the Nature
            - 1 Of riuers, fountaines, and lakes. Chap. 9.
            - 2 Of mountaines, valleyes, and plaine-Regions, woody, and champion Countreyes. Chap. 10.
          - Comparatiue, wherein we conſider the Termination of the Sea with t Land. Chap. 11.
        - Caſuall, which ſeldome fall out, ſuch as are Inundations and Earth-quakes. Chap. 12.
      - Ciuill, which concernes the Inhabitants of any place, in whom wee conſider the
        - Originall or off-ſpring. Chapter 13.
        - Diſpoſition which is varied, either according to the
          - 1 Site in reſpect of the Heauens. Chap. 14.
          - 2 Soyle. Chap. 15.
          - 3 Originall, or Education. Chap. 16.

Place this Analyſis after the ſecond Epiſtl *retaine a long time their firſt diſpoſition, though by little & little,*

GEOGRAPHIE: THE SECOND BOOKE.

CHAP. I.

Of Topographie and the nature of a place.

1 IN the former Treatiſe, by Gods aſſiſtance, wee haue treated of the *Sphericall* part of *Geographie*: It will in the ſecond place ſeeme conuenient to ſpeake of the *Topicall* part of it.

2 The *Topicall* part teacheth the deſcription of the *Terreſtriall* Globe, ſo farre forth as it is diuided into places.

The nature of *Topographie*, whereof we are to treat in this ſecond part, is diſcouered vnto vs, not only in the name, which promiſeth a deſcription of places; but alſo in the differences ſet downe by *Ptolomy* himſelfe, betwixt the *Sphericall* and *Topicall* part: the former of which hee cals *Geographie*, and latter *Topographie*; whereof wee haue ſpoken at large in the firſt Chapter of our former booke. Here onely wee will note this one diſtinction, that *Topographie* may bee taken either more generally, or ſpecially: Generally we may take it ſo farre foorth, as it diſcouers vnto vs either the whole world and all his parts, or at leaſt ſome great and principall parts; ſuch as is an *Empire*, *Region*, *Kingdome*, or ſuch like. More ſpecially and particularly, it hath vſually beene taken for the deſcription of a very ſmall place, whoſe ſituation in reſpect of the heauens is not noted, but of the parts one to the other: ſuch as are *Cities*, *Burrowes*, *Townes*, *Caſtles*, *Lakes*, and *Riuers*. The former (whereat wee chiefly aime) cannot well bee performed without the vſe of the *Sphericall* part: The latter we will more ſparingly touch, being an infinite taske in the whole earth to deſcend to all particulars which come in our way: yet ſhall wee not altogether omit or neglect ſuch circumſtances in their due places, ſo farre foorth as wee can; leauing the reſt to ſuch *Topographers*, who ſpend their ſtocke in the deſcription of ſome particular place or Region: whereof this our Age hath produced many deſeruing high commendations. This Science was anciently adorned by *Homer*, *Anaximander*, *Mileſius*, *Hæcatæus*, *Democritus*, *Eudoxius*, *Dicæarchus*, *Euphorus*, as wee finde in *Straboes* firſt booke: to which afterward ſucceede, *Eratoſthenes*, *Polybius*, *Poſſidonius*, and diuers others. Which part requires little or ſmall knowledge in the Sciences *Mathematicall*, but challengeth more affinity with the *Phyſicall* and *Politicall* part of *Philoſophie*; and therefore is more ſubiect to popular vnderſtanding then the former, and may without it, affoord ſome profit to the Reader.

3 The *Topicall* part is either generall, or ſpeciall: The generall is that which handles the generall Adiuncts of a place.

4 A place is a ſuperficiall ſpace of the Terreſtriall Globe, fitted for habitation.

To the conſtitution of a place (as it is here *Topographically* taken) there ought to be a concurrence of two things, which we may call Matter and Forme. The Matter is the ſpace contained; or ſuperficiall platforme of the earth whereon wee dwell. The forme is the capability or aptneſſe of it for habitation; both which concurring together are conceiued to make a place, ſuch as wee here *Topographically* vnderſtand: for here wee vnderſtand not a place *Phyſically*, for the receptacle of a naturall body; in which ſenſe the Heauens and all the elements are ſaid to haue their naturall places: Neither yet *Geometrically* for a plaine whereon a line or figure may bee drawne: but *Topographically* for the vpper face of the earth whereon people or other liuing creatures may inhabite. This place as appeares by reaſon and holy Scriptures was more ancient then habitation. For whereas in the firſt Maſſe the earth was inueloped with waters on euery ſide, affording no place for dwelling; Almighty God is ſaid afterwards to haue ſeparated and parted the waters from the dry land, making the one a Receptacle for Fiſhes, and ſuch creatures of the deepe, the other for a dwelling place for mankind, and ſuch creatures as breath vpon the land: yet hath hee ſo prouided in his diuine wiſdome, that neither the Inhabitants of the land can well want the Sea, nor the liuing creatures in the Sea want the land. The one appeares in that wee are inforced to make vſe of the ſea, not onely for food and nouriſhment, whereof a great part conſiſteth of fiſh: but alſo for our Traffique and commerce with forraine Nations, which is better effected by Sea then Land-voyages. The latter is as eaſily ſhewed, in that the fiſhes of the Sea deriue not onely their compoſition, but alſo their proper nouriſhment from the land: whereof wee ſhall haue more occaſion to ſpeake hereafter. Now wee are moreouer to conſider, that a *place* may bee taken in a double ſenſe: firſt more largely for any place wherein a creature may liue for longer or ſhorter time. Secondly, more ſtrictly for ſuch a ſpace of earth, whereon mankinde may conueniently reſide or dwell. The former comprehends not onely the land, but alſo the water; for experience ſhewes, that men in ſhips may for a time reſide and dwell on the backe of the maine Ocean. But the latter betokening a continuance of habitation, is onely agreeable to the land: Which ſenſe howbeit it be more conſonant to the common vſe of ſpeech, yet for methode ſake, wee are inforced to vſe the former: vnderſtanding by habitation, not onely a place of conuenient reſidence, but any other whereon a creature for a time may breathe aud liue.

1 *The Terreſtriall Spheare is euerywhere habitable.*

It was an ancient opinion (as we haue formerly touched) that the earth was not euerywhere habitable: namely, in the *Intemperate Zones*, whereof the one was placed in the middle of the earth, the other at the endes: the former was thought not habitable by reaſon of the extremity of heat; becauſe the Sunne-beames there fall perpendicularly, and ſo make a greater reflection; The other for extremity of cold, by reaſon of the obliquity of the Sunne-beames, cauſing little or no reflection: whence a ſecond cauſe ſeemes to be drawne from the extreame drought of thoſe places, which ſeemes moſt oppoſite to mans temper, requiring a reaſonable degree of moiſture. But notwithſtanding theſe reaſons of the ancients, it muſt needes bee confeſſed as an vndoubted truth, confirmed by experience of many Nauigatours, that thoſe Regions by them imagined vnfit for habitation, are not onely habitable, but in many places very populous. Neither want there many reaſons found out by latter writers, to mitigate the rigour of this opinion: ſome whereof wee haue already touched in our former treatiſe. Firſt, whereas they vrge the places vnder the Equinoctiall to bee vnhabitable by reaſon of intemperate heat; wee may eaſily anſwer, that the dayes and nights are then alwayes equall, containing not aboue 12 houres, ſo that the ſpace of either being ſhorter, the cold of the night may well aſſwage the extreame heat of the day. Another reaſon is ordinarily taken from the extraordinarily high mountaines, commonly placed vnder the Equinoctiall, which approaching neerer the middle Region of the aire, muſt of neceſſity partake ſomewhat more of cold: which dayly experience can witneſſe, in that their tops are couered with ſnow euen in the depth of Summer. Thirdly, the neereneſſe of the maine *Ocean* to a great part of this Region, is a great cauſe of this cold temper, becauſe water is found to bee by nature cold. Fourthly, the ſet and certaine windes by nature ordained to blow in the hotteſt times of the yeere, may adde much to temperature. Fiftly, the extraordinary Raines and ſhowers which thoſe places ſuffer, which are vnder the Line, eſpecially when the Sunne is verticall, are a great cauſe of the aſſwaging of the heat of the Sunne. Laſtly, the cuſtome of the Inhabitants being from their cradles inured to no other quality or diſpoſition of the ayre, will take away much from our admiration. On the other ſide no ſmall reaſons may bee ſhewed, why, the Regions lying neere or vnder the *Pole* ſhould not bee ſo extreamely cold, but that they may admit of habitation. Firſt, becauſe the Sunne being for ſix moneths together aboue their Horizon, muſt needs impreſſe into the Ayre more heat then otherwiſe it would doe. Beſides, the thickneſſe incorporated (as it were) with heat, muſt needs receaue into it more degrees of it then a thinner and more refined ayre, becauſe the intention of the quality moſt commonly ſuppoſeth the condenſation or thickning of the ſubiect wherein it is. But no greater reaſon can bee ſhewed in this point then the cuſtome of the Northerne inhabitants, expoſed from their infancy to no other temperament. If wee ſhould aske a reaſon why wee vnmaske our faces againſt the encounter of the greateſt cold, being a ſoft and tender part, not daring to vncouer our other parts, what reaſon can a man inuent but cuſtome? If any ſhould aske why barbarous people liuing in farre colder climates then this of ours, goe altogether naked, whereas the cold is mother of many diſeaſes amongſt vs who goe alwayes clothed; onely vſe and cuſtome can yeeld an anſwer. Theſe reaſons make it probable enough, that no place of the whole world is by nature made not habitable. Now that it is not only inhabitable by nature, but alſo for the moſt part truly inhabited, will appeare as eaſily, if wee truſt the teſtimony of Nauigatours which haue diſcouered few or no Regions wanting ſome inhabitants. But that this propoſition may bee more diſtinctly vnderſtood, wee muſt know that the whole world is diuided into *Sea* and *Land*: for the Sea we may call it habitable in that large ſenſe before mentioned; to wit, that on it euery where men in ſhips may breath and liue; which is plaine out of experience of Nauigatours, who haue ſailed round about the Earth from *Eaſt* to *Weſt*, and haue entred farre towards the *North* and *South*: where at leaſt ſome times of the yeere, or other they might finde the way paſſable: For the land which is here principally vnderſtood, wee muſt note that it may bee conſidered two wayes; either for euery little quillet or parcell of land contained in the ſuperficies of the Earth; or elſe for a certaine Region of ſome indifferent greatneſſe. In the former ſenſe, it were too much to affirme euery part of the Earth to bee habitable; for as much as many places, as the toppes of the *Alpes*, or the ſands of *Africa*, properly admit of no habitation; yet in an improper and large ſenſe they may be called habitable, becauſe on them a man may liue and breath for a certaine ſpace of time. But if by the parts of the land wee vnderſtand ſome reaſonable greatneſſe, no great doubt can bee made, but that it is either already inhabited by mankinde, or can at leaſt admit of habitation, as that which not only for a time affords a man life and breath, but alſo ſome conuenient meanes of ſuſtenance; for no countrey hath euer beene found ſo indigent and barren of all vitall aides, which is neither capeable of liuing creatures in the land, fit for mans nouriſhment; or that cannot draw *Fiſhes* from the Sea; or if this ſhould faile, cannot afford *Fruits* or Herbage from the ground: or in caſe all the reſt were deficient cannot haue paſſage by *Water* to other Countries, whence to releeue their neceſſities. And no queſtion but nature hath ſtored euery Countrey with ſome commodity or other, which by trafficke may draw riches from other Regions, as by inſtances may more particularly appeare hereafter when wee ſhall ſpeake of particular Regions, and their ſeuerall accidents.

2. *All places of the Earth haue ſuffered manifold*

fold alteration and change as well in Name as Nature.

I need not ſpend time to demonſtrate this Aſſertion , for that euery place of the Earth hath beene ſubiect to much mutation in the proceſſe of time, as well in Nature of the *Soyle* as of the *Inhabitants* , a few obuious inſtances in each Countrey will eaſily certifie : yet will it not ſeeme amiſſe , I hope , to ſhew the progreſſe , manner , and cauſes of this alteration , which would giue no ſmall ſatisfaction. To diſcourſe of all changes according to all times were a matter infinite : Wee may referre all to two heads, to wit, the change of *Names*, and the change of *Nature*. Concerning the former that moſt Countreyes haue changed their firſt and originall names , is moſt euident to ſuch as conſult the Maps and writings of our common Geographers : for few or none will diſcouer vnto vs any Region by that name , by which it was knowne in former times : in ſo much, as great controuerſie and diſpute hath growne about diuerſe countreyes mentioned by ancient writers, whereof the name ſhould take its firſt originall ; but of this change we ſhall ſpeake hereafter. But if we conſider the naturall changes of Countries, ſithence the firſt creation wee ſhall finde them to haue ſuffered as well in the naturall accidents, and diſpoſition of the ſoile, as the temper of the *Inhabitants* ; concerning the former wee may note a twofold alteration : whereof the one is a progreſſe from *Imperfection* to *Perfection* ; the other contrariwiſe , from *Perfection* to *Imperfection*. The firſt groweth out of the generall Induſtrie of mankinde , which is wont to worke euery thing as neere as it can to his beſt ends and vſe , for his owne good and propagation of his kinde : which wee may beſt finde in the firſt originall of the world , the firſt ground-worke of ciuill ſociety ; for man being once expelled out of *Paradiſe* for his owne tranſgreſſion , had left him notwithſtanding for his lot the whole world beſides , which no queſtion hee found as in the cradle of Nature a poore infant , as yet altogether vnfaſhioned and vnſhaped for humane habitation. For who can imagine the earth at that time to bee any otherwiſe then as a vaſt Wilderneſſe all ouergrowne with briers and buſhes growing of their owne accord out of the Earth: Moreouer what *Fennes*, *Bogges*, *Mariſhes*, and other ſuch incombrances could there bee wanting to thoſe places which neuer yet felt the chaſtiſing hand of husbandrie? All theſe incommodities, as mankind began to multiplie and propagate it ſelfe on the face of the Earth, were by little and little remoued, and the Earth reduced into a better forme for humane dwelling: becauſe euery man chooſing out his owne poſſeſſion, began preſently to till and manure the ſoyle with all heedfull induſtrie. For if our firſt Parents being placed in *Paradiſe* it ſelfe, the moſt pleaſant and fertile portion of the whole world, were neuertheleſſe enioyned to dreſſe and manure the Garden for their better vſe and profit; what ſhall wee imagine of the other parts of the Earth, which (no doubt) a thouſand degrees come ſhort of this perfection: eſpecially knowing this curſe to bee laid on man by our Creatour: *That he ſhould eat his bread in the ſweat of his browes*; as though the earth were bound to open her treaſures onely to mans paines and labour. And howſoeuer the diligence of mankinde hath gone very farre in adorning and faſhioning the vpper face of the earth, yet hath it not waded ſo farre, but that many places in our times are left altogether rude and vncultered, groaning vnder vaſt Wilderneſſes and vnprofitable deſarts. For times paſt wee might haue for inſtance, gone no farther then *Britanie* and *Germanie*; both which Countryes we ſhall finde in theſe dayes to differ as much from the dayes of *Cæſar*, as *Cæſar* iudged them to differ from the *Roman* Territory; which no doubt hee preferred before all parts of *Europe*. Notwithſtanding this generall inclination of mankinde to perfect their dwelling places for their better eaſe and comfort, wee ſhall finde many wayes whereby the parts of the Earth haue degenerated, and proued more vnfit for humane habitation then in former times. The firſt which is the greateſt, and cauſe of all the reſt, is that *Curſe* which our Almighty Creatour caſt on the whole earth for *Adams* ſake, which afterward ſeemes renued and increaſed in the generall deluge, wherein all mankinde ſuffered for their ſinnes a plague of waters. For as the eſtate of mankind immediatly before the *Flood* was farre better then that afterwards, ſo was the eſtate of *Paradice* farre better then that : So as wee may note from the beginning of the world a generall defect and weakeneſſe of the Creatures, ſtill more and more declining from their originall perfection granted in the firſt creation. So that many great Philoſophers haue coniectured, not without ground, that the world from the firſt creation hath ſuffered the change of ages ſenſibly ; and this wherein wee liue to bee the laſt and decrepite age ; wherein Nature lyeth languiſhing, as ready to breath out her laſt. But this opinion ſeemes to bee controled by reaſon; for as much as wee finde not a proportionall decrement and defect of naturall vigour in things, as well in man as other creatures. For if wee compare the eſtate of a man before the Flood, with the age of *Dauid* long after, wee ſhall finde a great diſparity in the proportionall decrement of the *Yeeres* and *Ages* of men : for as much as many before the Flood attained to 800, and ſome as *Methuſalem*, to 900 yeeres : But in *Dauids* time, the dayes of mans life (as he himſelfe teſtifieth) are threeſcore and ten : and admit wee vnderſtand this ſpeech of *Dauid* to bee meant only of his chiefeſt ſtrength and liuelyhood, wee ſhall yet finde a great diuerſity, becauſe man is vnderſtood to bee in his greateſt ſtrength and vigour in his middle age; ſo that the whole age of man by this account ſurmounts not 140 yeeres. To which proportion of defect or decrement our times can no way agree, becauſe many men in our dayes come neere the ſame age, as we ſee by experience, which may bee confirmed by diuerſe inſtances, whereof wee will produce only two : the one of a certaine *Indian* preſented to *Soliman* the *Turke*, being of the age of 200 yeeres : the other of the Counteſſe of *Deſmond* in *Ireland* (which Sr *Walter Rauleigh* mentions to this purpoſe) who was married in *Edward* the fourth's time, yet was aliue very lately. But to this doubt I might anſwer, that this extraordinary difference betwixt the ages of men, betweene the *Patriarches* and *Dauids* time compared with men, ages betwixt *Dauids* and our dayes, came from two eſpeciall cauſes : Firſt by the vniuerſall *Deluge*, which cauſed a generall defect and decay of nature in the whole earth, the like whereof hath not ſince beene found:

Secondly, it was (as it ſeemes) much impaired by the *Intemperance* and luxurious diet of thoſe times, which added much to this generall weakneſſe of nature: for as much as the children can haue little or no naturall perfection in themſelues more then is deriued vnto them by their parents. For nothing can giue that to others which it neuer had it ſelfe; whence it muſt needs come to paſſe, that the poſterity deriued from luxurious and diſtempered bodyes, ſhould proue as weake and impotent generally (if not more) then their Parents. Now why the people ſoone vpon the Flood ſhould finde their diſtemperature more noxious and preiudiciall to long life then the men of our age, a good reaſon may bee giuen; becauſe the Earth long after the Flood had not fully receaued that naturall heat and ſpirit which it loſt in the *Deluge.* So that all things ariſing out of it, as *Plants*, *Hearbs*, *Fruits*, and liuing creatures feeding thereon, proued for a while more vnwholſome and vnnaturall, then in ſome yeeres after, when it had ſomewhat reuiued it ſelfe by the heat of the *Sunne* and the *Starre*, and by little and little returned to his owne nature. The other cauſe of deficiencie is more ſpeciall, as not happening to all, but to diuerſe parts of the Earth, and that more at one time then another: as the neglect of due manuring many places, cauſed commonly two wayes; either by contagion naturally incident to diuerſe places, or by hoſtile *Inuaſion* and deuaſtation: of this latter ariſe two maine effects; The firſt is the want and ſcarcity of Inhabitants, which ſhould dreſſe and manure the ground to make it more fruitfull and accommodate to mans vſe. The ſecond is their *pouerty* and *captiuity*; whereof the one makes them vnable, the ſecond vnwilling to effect any great matter for the benefit of the Land. A good inſtance whereof wee may finde in the land of *Paleſtine*: which in times paſt by God himſelfe was called, *A land flowing with milke and hony*, for the admirable pleaſantneſſe and fertility of the Soile: yet at this day, if wee will credit trauellers report, a moſt barren Region, deuoid almoſt of all good commodity fit for the vſe of man, in the ruines of which, ſometimes famous kingdome, euery bleere-eyed iudgement may eaſily read Gods curſe long ſince denounced; Which ſtrange alteration next vnto Gods anger wee can aſcribe to no other cauſe then the hoſtile inuaſion of forraine enemies, which hath almoſt left the land waſte without the natiue Inhabitants; whence it could not chuſe in a ſhort time but degenerate from the ancient fruitfulneſſe. The like may we finde in all thoſe miſerable Regions which groane at this day vnder the tyranny of the vſurping *Turke*: whence a prouerbe runnes currant amongſt them: *That where the Turkes horſe hath once grazed, no graſſe will euer after grow*: which ſignifies no other then the barbarous manner of the *Turkes*, hauing once conquered a land, to lay it open euer after to deuaſtation: for being for the moſt part warlike men trained vp in martiall diſcipline, they little or nothing at all regard the vſe of husbandry: whence in ſhort time a Countrey muſt needs turne wild and vnfruitfull. To theſe cauſes we may adde the influence of heauenly conſtellations, which being varied according to the times, produce no ſmall effects in the changes and alterations of the earth. The diuerſe alteration in the diſpoſition of the Inhabitants which was our ſecond point, we haue reſerued to another place neere the end of this tract, to which is properly appertaines.

3 *Places hauing long continued without habitation are ſeldome ſo healthy and fit for dwelling as thoſe which haue beene inhabited.*

This Propoſition I haue knowne to bee warranted by the Teſtimonie of many experienced Nauigators: in ſo much as I preſume few men can doubt of the truth of it, who hath either beene a Traualler himſelfe into farre Countreyes, or at leaſt hath read other mens diſcoueries. The onely matter therefore wee here intend, is to produce certaine cauſes of this effect, to giue ſatisfaction to ſuch as make a diſtinction betwixt the knowledge of the effect, and inquiry of the cauſe. The firſt cauſe which I can alleage is the induſtrie of mankinde inhabiting any Countrey (mentioned in the former Theoreme) out of which ariſeth a twofold effect. 1 The improuing of the Soyle, by remouing all ſuch impediments as otherwiſe would proue noyſome to mankinde; for whereas all things growing of their owne accord, are ſuffered to rot into the ground; in like manner what other can wee expect but Fennes, Fogges, and noiſome vapours, altogether hurtfull to the welfare and life of man. 2 The profit of mans induſtrie is no leſſe apparent in manuring the ground, and opening the vpper face of the Earth: which being compoſed of diuerſe ſubſtances, ſendeth forth many times certaine hot fumes and vapours, which in many cold Countreyes mollify the vſuall rigour of the Aire, which moſt offends the Inhabitants. This reaſon is giuen by my Countrey-man Captaine *Whitborne* for the extreame cold, which ſome men profeſſe themſelues to haue tried in *New-found-land*, which neuertheleſſe, according to many mens deſcription, is knowne to lye farre more South then *England*: for the natiues of the Countrey being for the moſt part driuen into the North part by the *Europeans*, who vſually trade there for fiſh, and they themſelues liuing altogether on Fiſh from the Sea; or ſome wild beaſts on the land, as *Beares*, *Deare*, and ſuch like; without any manuring of the ground for herbage; The Soyle by them is in a manner left altogether vnmanured: ſo that neither the ſoyle can bee well cleanſed from noiſome vapours ariſing from the putrefaction of herbage rotting (as I ſaid) into the ground, or left free to ſend out ſuch wholſome fumes and vapours from its interiour parts, which may warme the Ayre, and preſerue mankind. 3 A third reaſon drawne from mens Induſtries, that thoſe Countreyes which haue inioyed Inhabitants by the continuall vſe of *Fires*, haue their Aire more purged and refined from droſſie and noiſome vapours, which vſually ariſe out of a contagious ſoyle, daily infected by putrefaction: for ſcarce any nation hath beene knowne ſo barbarous and ignorant which hath not the inuention and vſe of Fire: neither is any infection of the aire ſo peſtilent, and oppoſite to humane conſtitution, which the breath of fire will not in ſome ſort diſpell. If any man obiect the diſtance of houſes and villages wherein fire is vſed, which ſeeme to claime a ſmall intereſt in the change of the ayre hanging ouer a whole Countrey: let him well conſider the quickneſſe of motion and fluidity of the Ayre, paſſing (as it were) in a moment from one place to the other, and hee may ſoone anſwer his owne obiection. All thoſe reaſons hitherto mentioned an inhabited Region owes to mans induſtrie, which wee generally touched in the precedent Theoreme. The ſecond cauſe which is as a conſequent of habitation, is the neceſſity of breathing of people liuing in any Region of the earth, whereby may follow two effects. 1 A certaine meaſure of heat impreſſed into the aire, as wee ſee in any roome in a great throng of people, by reaſon of their breathing together in one place. 2 The aſſimilation of the Aire to humane bodies, by a continuall reſpiration. Theſe alterations of the aire, might perhaps to common apprehenſions, ſeeme ſmall and inſenſible. But hee that conſiders how great a quantity of aire is requiſite for a mans reſpiration, and the ſpace and extent of motion together with the multitude of Inhabitants in a populous Countrey, would hold it no ſtrange matter; that the breathing of men ſhould breed ſuch an alteration of the aire: wee finde by experience, that ſtrong built houſes being left tenantleſſe, will ſoone fall into decay, not ſo much for want of reparation, as the foggy vapours and moiſture, cauſed by want of Reſpiration. The like whereof in ſome proportion may we imagine to be in a region wanting Inhabitants, and depriued of this benefit of nature.

CHAP. II.

Of the Generall Adiuncts of Places.

1 IN a place Topographically taken two things are to bee conſidered. 1 The *Adiuncts.* 2 The *Deſcription*: The Adiuncts are ſuch proprieties as agree to ſpeciall places.

2 Such Adiuncts agree to a place, either in reſpect of the *Earth* it ſelfe, or in reſpect of the *Heauens*: Thoſe which agree to a place in reſpect of the Earth, are either *Internall* or *Externall.*

3 The Internall I call ſuch as are inbred in the Earth it ſelfe: which are of two ſorts; either *Common*, or *Magneticall.*

4 The Common are in number three. 1 The *Magnitude*, or extent of a Countrey. 2 The *Bounds.* 3 The *Quality.* The Magnitude comprehends the Length and Breadth of any Region.

Some man might imagine that I make a needleſſe repetition of theſe proprieties: for as much as many of them ſeeme to haue beene ſpoken of before in our *Sphericall* part. But I anſwer that I there handled no other matters, but ſuch as concerned the whole globous body of the Earth; but my intent here is to treat of ſuch proprieties, as particularly deſigne out a ſpeciall place. For it is not one thing to ſpeake of the *Magnitude* of the whole Earth, according to all its dimenſions; and to treat of the manner of meaſuring ſome particular Region, marked out in the Spheare. Wee haue defined the Magnitude of a Region to bee either of *Length* or *Breadth*: becauſe (as wee haue taught in our former chapter) it is a ſpace contained in the ſurface of the Earth. Then can it not according to Geometricall grounds, exceed two Dimenſions: Theſe two Dimenſions (as wee haue ſaid) are length and breadth, whereof euery plaine figure, or ſuperficies conſiſts.

5 The Magnitude of a Region may bee mea-

ſured two wayes: either by the *Diameter*, or the *Circumference*. The Diameter is conſidered either in Latitude or Longitude: of the Latitude, whence ariſeth the Breadth of a Countrey from North or South, note theſe Rules.

1. *If the place whoſe breadth is ſought, bee diſtant from the Equatour, and bee wholy ſituate in the ſame Hemiſpheare, the leßer Latitude ſubtracted from the greater will giue the Diameter.*

To put this Rule in practiſe, it behooues the Topographer, who would finde out the greatneſſe of any Region, to obſerue two Latitudes: to wit, to meaſure the Latitude in the moſt Northerne point, where it is greateſt: as alſo in the Southerne point, where it is leaſt of all. This latter ſubducted from the former, will giue the Diameter or breadth from North to South: which may eaſily, according to the Rules in the fotmer booke, bee reduced into Miles, or other ſuch meaſures. For an example wee need goe no farther then our Iland of *Great Brittaine*: The Southmoſt part of which lying about *Star-point* in *Deuon*, hath in Latitude about 50 degrees: The Northermoſt point ſituate neere the mouth of the riuer *Ardurnus* in the farthermoſt part of *Scotland*, hath in Latitude about 60 degrees (to omit minutes) The leſſer of theſe Latitudes ſubtracted from the greater, the reſidue will bee 10 degrees, which being imagined in the Meridian which is a greater circle, are to be multiplied by 60, and ſo conuerted into miles, which will be 600, the length of *Brittany* from South to North.

2. *If the place whoſe Magnitude wee enquire, bee vnder the Equatour, the Southerne Latitude*

added to the Northerne will ſhew the breadth from the North to the South.

To illuſtrate this by an example, wee will take the whole continent of *Africa*, whoſe Southerne Latitude about the Cape of *Good hope*, wee ſhall finde to bee neere thirty Degrees, the moſt Northerne Latitude about the ſtraights of *Gibralter*, very neere the ſame rate: Theſe two ſummes added together will amount to 60 Degrees, which multiplied by 60, the number of miles anſwerable to a degree in a great circle (becauſe wee ſuppoſe it here to bee an Arch of the Meridian) we ſhall haue 3600 miles, the breadth of *Africa* from South to North.

4 The meaſure of the length of a Region betwixt Eaſt and Weſt, admits of two caſes: for either the Countrey is ſuppoſed to be without the firſt Meridian, or vnder it: both which ſhall be taught in theſe Rules.

1 *If the Region be ſituate without the firſt Meridian, the leſſer Longitude ſubtracted from the greater, will ſhew the Diameter betwixt Eaſt and Weſt.*

For an example of which wee will take *Cape de Barca*, lying ouer againſt S. *Thomas* Iland in *Africa*, vnder the Equatour, whoſe Longitude is about 30 Degrees, and *Melnide* ſituate neere the Equatour ouer againſt *Sinus Barbaricus*, on the other ſide of *Africa*, which hath in Longitude 63 Degrees. The leaſt Longitude, to wit 30, being ſubducted from 63, there will remaine 33 Degrees; which being taken in a greater circle, which is the Equatour, or a Parallell very neere (which admits no ſenſible difference) we multiply by 60, and there will ariſe 1980 *Italian*-miles, but if the Degrees be taken in one of the leſſer Parallells, we muſt proceed according to the Table of miles anſwerable to Degrees of Latitude in the former booke.

7 Another Caſe is when the place is ſituate vnder the *firſt Meridian* : The length and meaſure of ſuch a Region is found out by this Rule.

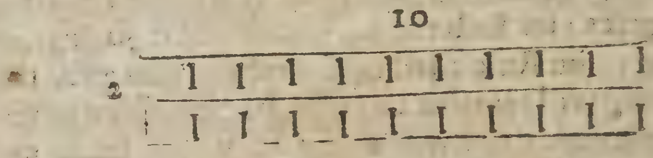
1 *Let the Weſterne Longitude bee ſubtracted out of the whole circle, and to the Reſidue added the Eaſterne Longitude, the ſumme will giue the greatneſſe and diſtance betwixt Eaſt and Weſt.*

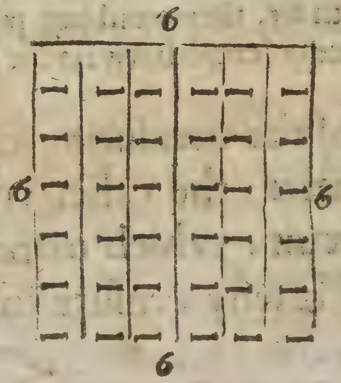
For an inſtance wee will take *Groenland*, ſuppoſed in moſt of our Globes and Mappes, to bee an Iland which is ſet downe directly vnder the firſt Meridian, paſſing by the *Azores* in *Karius* his Globe : It hath aſſigned it for Weſterne Longitude about 340 Degrees : for Eaſterne Longitude about 30 degrees. Then according to our Rule 340 bee ſubtracted from 360, the whole circle there will remaine 20, which being added to 30 the Eaſterne Longitude there will ariſe 50 : which being multiplied by 25, the number of miles anſwerable to the Latitude of the place, being about 65, there will bee produced 1250 *Italian* miles, the diſtance or length betwixt the Eaſt and the Weſt part of *Groenland*.

8 Hitherto of the meaſuring of Countreyes by the Diameter, the other way is performed by the circuit : which manner of meaſuring wee will briefly cenſure in theſe two Propoſitions.

1 *The meaſuring of any Countrey by the* Circuit *of it, is very deceitfull and full of errours.*

It hath beene a common cuſtome amongſt Nauigatours to iudge of the greatneſſe of any Countrey, by ſayling round about it: which kind of meaſuring is not alwayes to be reiected: for as much as in new diſcoueries ſometimes no other way can bee had. Neuertheleſſe this manner of meaſuring muſt needs proue very vncertaine for diuers reaſons. Firſt in regard of the motion of the ſhip, which by reaſon of diuerſe and contrary winds, which muſt needs happen very frequently, cannot alwayes moue with the ſame ſwiftneſſe. Secondly becauſe the Sea it ſelfe (as wee ſhall hereafter ſhew) hath in diuerſe places diuerſe ſpeciall motions and currents, as from the Eaſt to Weſt; whence it muſt needs inforce an inequality of motion in the ſhip. The third reaſon, which is greater then all the reſt, is drawne from the various *Figuration* of Countreyes, whoſe greatneſſe cannot bee knowne by the circumference. Becauſe (as *Geometricians* teach vs) two figures may haue one and the ſelfe-ſame circuit about them, and yet the one ſhall extraordinarily exceed the other in greatneſſe: as for example, let there be





imagined two *Parallelogrammes*; the one an exact ſquare of ſix foot; the other a long ſquare of 10 foot in Length, and two in Breadth. The one comprehends 36 ſquare feet, the other 20, as will appeare by multiplication of their ſides, the one into the other: in which numbers there is a great inequality. Yet notwithſtanding if we meaſure the circuit or circumference of each Figure, we ſhall finde them equall, to wit, of 24 foot, as will appeare by their figures here prefixed. For amongſt thoſe Figures called *Iſoperimetrall*, or of equall Perimeter, that is alwayes to bee eſteemed the greateſt, which is the more *Ordinate* figure: which is that, which commeth neereſt to an equality of *Sides* and *Angles*. But in *Inordinate* Figures (of which nature for the moſt part are all Regions) infinite errour may be committed, if we meaſure them by circumnauigation: wherefore to meaſure a Countrey more exactly it behoooueth vs not only to know the *Circumference*, but alſo the *Diameter*.

2 *Thoſe Countreyes are more exactly meaſured which partake of a plaine ſurface.*

The reaſon of this Propoſition is eaſily ſhewed, becauſe a *plaine Superficies* conſiſts of right lines. But a right line (as *Euclide* witneſſeth) is the ſhorteſt betwixt his owne bounds: whereas betweene two points infinite crooked lines may bee drawne: whence it muſt needs follow, that more certainty and exactneſſe is to bee expected in the meaſure of a *Plaine* Countrey whoſe *Diameter* is a *Right* line, then from a *Crooked* and hilly trey Region, where the Corde is crooked and gibbous. Whence ſome *Mathematicians* haue demonſtrated, that more men may ſtand on a Sphericall Superficies, as a Hill or mountaine, then on a Plaine, although both are found to be of the ſame *Diameter* It may bee here obiected, that the earth is euery where crooked and orbicular, and therefore no part thereof can bee meaſured by a *Right line*: I anſwer that the Earth is indeed *Sphericall* (as wee haue formerly proued) yet may ſome little part or portion thereof bee counted as a *Plaine*; becauſe ſuch parts haue little or no proportion to the whole maſſe of the Earth. This conuexity therefore being ſo little, may paſſe for a plaine without any ſenſible errour. Hence wee may gather that the Land cannot ſo exactly bee meaſured as the Sea. For as much as the land for the moſt part is vneuen, varied with hills, Dales, and other inequalities. But the Sea euery where plaine and like it ſelfe, except the riſing of the waues and ſurges, which in ſo great a diſtance will make no difference at all. Secondly, we may hence collect that of two Countreyes of the ſame bounds and figure, that muſt bee the greateſt whoſe ſoyle and ſuperficies is moſt varyed and crooked: becauſe (as wee haue ſaid) crooked lines betwixt the ſame points are longer then right, and therefore meaſure the greater Magnitude.

9 Thus much of the Magnitude. The *Bound* of a Countrey is a line compaſſing it round.

This definition is very euident, in that euery Region is *Topographically* conſidered as a *Plaine* or *Superficies*, whoſe bound is a line compaſſing it round: for as a *Line* is bounded by a *Point*, ſo a *Superficies* by a Line, as wee are taught in *Geometry*. Now wee muſt conſider that the bounds of Countreyes may bee taken two manner of wayes: Firſt *Geometrically*, for the meere line, which is imagined to goe round about it: Seconly, *Geographically*, for the viſible markes and Characters, whereby the line is traced out vnto vs, ſuch as are *Riuers*, *Cities*, *Hills*, *Caſtles*, and ſuch like. Theſe markes whereby a *Topographer* noteth out vnto vs the bounds and limits of Countreyes, are of two ſorts; either *Naturall* or *Artificiall*. The naturall are ſuch as are deriued from nature without mans appointment, ſuch as are *Riuers*, *Creekes*, *Mountaines*, *Woods*, and ſuch like other matters, which bound the extents of Countreyes. The Artificiall bounds are ſuch as depend vpon ſome conſtitution or decree of a man, which ſo diuide one Countrey from another: the partition being often made where no notable marke or bound is ſet by nature.

1 *Naturall bounds are more certaine then Artificiall.*

The reaſon is becauſe naturall ſignes or markes which are ſet for bounds of Countreyes are alwayes the ſame, and (as it were) continued from the firſt creation: and cannot bee changed without ſome great *Earthquake*, *Jnundation*, or ſuch like alteration in nature, which very ſeldome happeneth, and in very few places: whereas on the contrary part, ſuch bounds and limits, as depend vpon mans appointment, may bee altered and changed according to the wills and diſpoſitions of men: as wee daily ſee amongſt vs, that ancient lands and inheritances are much queſtioned concerning their bounds and limits: as alſo great controuerſie is made amongſt Geographers concerning the bounding of Countreyes and Territories, anciently knowne and defined by old writers: For names and particular contracts betwixt men in a few ages, may eaſily ſlip out of memory; eſpecially when the poſſeſſours themſelues (as it often happens) ſtriue to extinguiſh and raze out the memory of former ages, leauing behind them no marke or ſigne to tell the world their wronged neighbours right, or the limited fortunes of their owne poſſeſſions.

2 *Equall bounds doe not alwayes containe equall Regions.*

This Propoſition is plainely demonſtrated before in this very Chapter: wherein wee haue proued of two figures ſuppoſed equall in the circumference, that to bee the greateſt, which more neerely approacheth an *Ordinate* figure: which wee define to bee that which commeth neereſt to an equality of Sides and Angles. So that two Regions, the one round, the other ſquare, may haue an equall compaſſe about, and yet the former will bee a great deale greater, in reſpect of the ſpace therein contained.

10 In the next place we are to conſider the Quality. By the quality I vnderſtand the naturall temper and diſpoſition of a certaine place.

1 *Speciall places are endowed with ſpeciall tempers and diſpoſitions.*

That Almighty God, who created the whole world, hath not, granted the ſame gifts and indowments to all Countreyes, but hath diuided diuerſe commodities to diuerſe Regions, ſeemeth a matter out of all controuerſie. For who findes not by experience one Countrey *hot*, another *cold*, a third *temperate*: one *fruitfull*, another *barren*, a third *indifferent*: one *healthie*, another *vnwholſome*. The like diuerſity is alſo found in the inhabitants themſelues, according to that common prouerbe: *Valentes Thebani, Acutiores Attici*: whence this diuerſity ſhould ariſe, it is a hard matter to vnfold; for as much as many cauſes herein concurre, ſometimes to helpe, ſometimes to croſſe one the other: yet will I ſtriue as neere as I can to reduce them to certaine Heads, by which a generall gueſſe may bee giuen to the particulars. The firſt reaſon may bee drawne from the ſituation of the Earth, in reſpect of the heauen and Starres therein fixed. This may cauſe a diuerſity of diſpoſition two wayes; 1. By reaſon of the Sun, and his generall light and influxe: whence in the Earth are ingendred the foure firſt qualities of Heate, Cold, Drouth, and Moiſture, whereon depends a great part of the diſpoſition, not only of the ſoyle, but alſo of mans body: for as much as the one ordinarily borrowes his fruitfulneſſe or barrenneſſe of theſe firſt qualities: and the other hath his vitall Organes (which are the miniſters of the Soule) much affected with them; in ſo much as ſome Philoſophers haue vndertaken to define all the differences of mens wits and intellectuall faculties out of the Temperament of the braine, according to theſe foure accidents. And what Phyſitian will not acknowledge, all theſe Qualities and their mixture to challenge an extraordinary preheminence in the diſpoſition and conſtitution of mans body, whoſe mixture is the firſt ground of health or ſickneſſe. The ſecond meanes whereby the Heauens may cauſe a diuerſity of temper in diuerſe places, is from the *ſpeciall Influences* of ſome particular Starres and conſtellations incident to particular places: for it were blockiſh to imagine that ſo many various Starres of diuerſe colours and magnitudes ſhould bee ſet in the Firmament to no other vſe then to giue light to the world, and diſtinguiſh the times: ſith the ordinary Phyſitian can eaſily diſcouer the Moones influence by the increaſe of humours in mans body: and the experience of Aſtrologers will warrant much more by their obſeruation: as aſſigning to each particular aſpect of the Heauens a particular and ſpeciall influence and operation. Now it is euident that all aſpects of the Heauens cannot point out and deſigne all places alike; for as much as the beames wherein it is conueyed, are ſomewhere perpendicularly, other where obliquely darted, and that more or leſſe according to the place: whence it commeth to paſſe that neither all places can enioy the ſame Temperament, nor the ſame meaſure and proportion. Yet wee ſay not that the heauenly bodyes haue any power to impoſe a *Neceſſitie* vpon the *wills* and diſpoſitions of men; but onely an inclination: For the Starres worke not Immediatly on the intellectuall part or minde of man, but Mediatly, ſo farre forth as it depends on the Temperament and materiall organes of the body. But of this wee ſhall eſpecially ſpeake hereafter. Where (God willing) ſhall bee opened the manner of this celeſtiall operation. By this wee may vnderſtand how farre the Heauens haue power to cauſe a diuerſity in Places and Nations. The ſecond reaſon may bee the *Jmbred Quality*, *Figure*, and *Site* of the Places themſelues; For that there is another cauſe of diuerſity beſides the ſituation of places in reſpect of the Heauens, may eaſily bee proued out of experience; for wee finde that places ſituate vnder the ſame Latitude, partake, of a diuerſe and oppoſite Temper and diſpoſition, as the middle of *Spayne* about *Toledo*, which is very hot and the Southermoſt bound of *Virginia*, which is found to bee Temperate betwixt both: All which notwithſtanding are vnder the ſelfe-ſame Latitude, or very neere, without any ſenſible degree of difference: alſo we ſometimes finde places more Southward toward the Equatour to partake more of cold, then ſuch as are more Notherne, as the Toppes of the *Alps* being perpetually couered with Snow, are without queſtion colder then *England*, although they lye neerer to the equinoctiall. Likewiſe *Aluares* reporteth that hee ſaw Ice vpon the water in the *Abyſſines* Countrey in the month of July, which notwithſtanding is neere or vnder the Line. And *Martin Frobiſher* relates, that he found the ayre about *Friezland* more cold &

ſtormy about 61 degrees then in other places neere 70 degrees. Wherefore we muſt needs aſcribe ſome effect and operation to the ſoyle it ſelfe: firſt in reſpect of the *Superficies* which is diuerſly varied with *Woods*, *Riuers*, *Mariſhes*, *Rockes*, *Mountaines*, *Valleyes*, *Plaines*: whence a double variety ariſeth: firſt of the foure firſt *Qualities*, which is cauſed by the *Sunne-beames* being diuerſly proiected according to the conformity of the place: Secondly, of *Meteors* and *Exhalations* drawne vp from the Earth into the Aire: both which concurring muſt needs cauſe a great variety in mans diſpoſition: according to that prouerbe, *Athenis tenue cœlum, Thebis craſſum*: or that bitter taunt of the Poet on *Bœotians*, *Bœotum in craſſo iurares aëre natum.* For ordinary experience will often ſhew that a thinne and ſharp ayre vſually produceth the beſt witts; as contrariwiſe groſſe and thicke vapours drawne from muddie and mariſh grounds thicken and ſtupifie the ſpirits, and produce men commonly of blockiſh and hoggiſh diſpoſitions and natures, vnapt for learning, and vnfit for ciuill conuerſation. Secondly, there muſt needs be granted to ſpeciall Countreyes, certaine *Specificall* qualities, which produce a certaine *Sympathie*, or *Antipathie* in reſpect of ſome things or others: whence it commeth to paſſe that ſome plants and hearbs, which of their owne accord ſpring out of the Earth in ſome Countreyes, are found to pine & wither in others: ſome Beaſts and Serpents are in ſome places ſeldome knowne to breed or liue, wherewith notwithſtanding other Regions ſwarme in abundance: as for example, *Ireland*, wherein no Serpent or venomous worme hath beene knowne to liue, whereby *Africa* and many other Countreyes finde no ſmall moleſtation. Neither is this variety onely ſhewne in the diuerſity of the kindes, but alſo in the variation of things in the ſame kinde, whereof we might produce infinite examples. For who knowes not, which is a Phyſition, that many ſimples apt for medicine growing in our land, come farre ſhort in vertue of thoſe which are gathered in other countreyes. I need amongſt many ordinary inſtances giue no other then in our *Rubarb* and *Tobacco:* whereof the former growing in our Countrey, except in caſe of extremity, is of no vſe with our *Phyſitians*: the other as much ſcorned of our ordinary Tobacconiſts: yet both generally deriued from the true mother the *Indies*, in great vſe and requeſt. But of this laſt Inſtances are moſt common, and yet for their ignorance of the true cauſe, moſt admirable. The cauſes of the former might in ſome ſort bee found out either in the Heauens, or in the Elementary nature of the Earth. But ſome ſpeciall proprieties haue diſcouered themſelues, which cannot be imagined to owe their cauſe to either, but to ſome third originall, which the Phyſicians in their Simples more properly tearme *virtus ſpecifica*. If any man ſhould demand why countreyes farther from the courſe of the Sunne ſhould be found *hotter*, then ſome which are neerer? Why the *Rheniſh* wine Grape transported from *Germany* into *Spaine*, ſhould yeeld vs the *Sherry Sacke*? Euery ordinary Phyloſopher, which hath traueled little beyond *Ariſtotles Materia Prima*, will bee ready to hammer out a cauſe, as aſcribing the former to the Heigth or Depreſſion of the ſoyle: the latter to the exceſſe of heat in *Spaine* aboue that of *Germany*. But ſhould wee farther demand, 1 why *Ireland* with ſome other Regions indure no venemous thing. 2 Why Wheat in S. *Thomas* Iland, ſhould ſhut vp all into the Blade, and neuer beare graine? 3 Why in the ſame Iland no fruit which hath any ſtone in it, will euer proſper? 4 Why our Maſtiffes (a ſeruiceable kinde of creature againſt the moleſtation of Wolues, and ſuch hurtfull beaſts) tranſported into *France*, ſhould after a litter or two degenerate into Curres, and proue altogether vnſeruiceable? 5 Why with vs in *England*, ſome places produce Sheep of great ſtature but courſe wooll; other places ſmall Sheep, but of very fine wooll: which being naturally tranſplanted, will in a generation or two ſo degenerate the one into the others nature, that the greater ſheep looſe ſomewhat of their greatneſſe, yet improue their fleeces; as the other increaſe their ſtature, but looſe much in the fineneſſe of their wooll? 6 Why many places at the ridge of the mountaines *Andi* in *America* cannot bee paſſed ouer without extreame vomitting and griping euen vnto death. 7 Why a Riuer in the *Indies* ſhould haue ſuch a nature to breed a great long worme in a mans leg, which oftentimes proues mortall vnto the patient, with infinite the like examples found in Geographers, concerning the nature and accidents of *Fountaines*, *Hearbs*, *Trees*, *Beaſts*, and *Men* themſelues (as wee ſhall ſhew hereafter) ſo much varied according to the diſpoſition of the ſoyle, what wiſer anſwer can an ingenious man expect then ſilence or admiration? for to make recourſe to *Sympathies*, *Antipathies*, and ſuch hidden qualities with the current of our Philoſophers, is no other then in ſuch ſort to confeſſe our owne ignorance, as if notwithſtanding, wee deſired to bee accounted learned: for beſide the difference of the termes wherein euery Mountebanke may talke downe a iudicious Scholler; I ſee no aduantage betwixt a Clowne which ſayes he is ignorant of the cauſe of ſuch an effect, or of a iuggling Scholler which aſſignes the cauſe to bee a ſympathie, antipathie, or ſome occult quality. I ſpeake not this to countenance ſupine blockiſhneſſe, or to caſt a blocke in the way of curious induſtrie. The former diſpoſition I haue alwayes hated, and the latter ſtill wiſhed in my ſelfe, and admitted in others. All which I can in this matter propoſe to a curious wit to bee ſought, muſt bee reduced to one of theſe two heads: for either ſuch admirable effects as we haue mentioned, muſt ariſe from ſome *Formall* and *Specificall* vertue in the ſoyle, or from ſome extraordinary Temperament made of a rare combination of the Elements, and their ſecondary mixtures, as of *Hearbs*, *Stones*, *Mineralls*, and vapours ariſing from ſuch, and affecting the Aire: of both which wee ſhall haue ſome occaſion to treat in the particular Adiuncts of places; yet ſo, as I feare I ſhall neither giue my ſelfe content, or my Reader any ſufficient ſatisfaction. But *In magnis voluiſſe ſat eſt.*

11 Hitherto of the common imbred Adiuncts of the Earth Topographically taken: Next we will ſpeake ſomewhat of the *Magneticall* Affections of a place: Theſe are in number two, viz: *Variation* and *Declination.*

We haue in our former Treatiſe of the *Magneticall* nature of the Earth handled diuerſe other affections, growing from the Magneticall Temper and diſpoſition of the terreſtriall Globe: whence ſome man might here collect this repetition to bee altogether needleſſe, or at the leaſt imperfect, omitting many other of the Magneticall Affections. To this I anſwer, that it is one thing to ſpeake of theſe Affections as they agree to the whole Spheare of the Earth: Another thing to conſider them, as they are particular proprieties, and markes of particular places and Regions. In the former ſort haue we) beſides the Variation and Declination) handled many other affections of the Earth magnetically conſidered. Wee here onely ſpeake of theſe two, as they are ſpeciall markes and proprieties of ſqeciall places: which it behooues a *Topographer* to obſerue as a matter worthy of obſeruation in the deſcription of any place. The vſe ſhall be commended vnto vs in theſe two Theoremes.

1 *The Magneticall* Variation *is of no vſe for the firſt finding out of the Longitude; yet may it ſerue to good purpoſe for the Recognition of a place heretofore diſcouered.*

The reaſon of this wee haue ſhewne in our former booke; becauſe the variation ſeldome or neuer anſweres proportionally to the Longitude, as ſome of the ancients on falſe grounds haue ſurmiſed: whence no true conſequence can bee drawne from the variation of a place to the finding out of the Longitude; yet may it bee of ſpeciall vſe for the new finding out of ſuch places as haue formerly by others beene firſt diſcouered, ſo the variation were firſt by them diligently and faithfully noted and obſerued: firſt becauſe few places in the Earth can exactly and preciſely agree in the ſelfe-ſame variation; but in ſome Degree or minute will bee found to varie. Secondly, if any two places ſhould bee found to accord in the ſame Degree of *Variation*; yet comparing the variation with the degree of *Declination*, wee ſhall commonly finde a difference: for as much as places agreeing in variation, may notwithſtanding varie in the Declination.

Thirdly, if two places ſhould be equalized in both (as wee cannot deny it to bee poſſible) yet the comparing of theſe two Magneticall motions with other affections, as well in reſpect of the Earth it ſelfe as of the Heauens, will giue at leaſt a probable diſtinction: of which caſes it is not hard out of the obſeruations of our new writers and Nauigatours to giue particular inſtances. Concerning the *firſt*, we finde the variation of the compaſſe at *Cape Verde*, to bee iuſt 7 Degrees; about the Ilands neere to *Cape Verde* to amount only to 4 Degrees; whence a Sea-man (if other helpes failed) may hereafter, as he paſſeth, diſtinguiſh the one from the other, and if occaſion ſerue, correct this errour. In the like ſort might a man (otherwiſe altogether ignorant of the place) out of former obſeruations, in the ſame Iland of *Cuba* diſtinguiſh betwixt *Cape Corientes* and *Cape S. Anthony*; In that the one hath only 3 degrees of variatiō, wheras the other hath 13: for an inſtance of the *ſecond caſe* we will take the coaſts of *Braſill* 100 leagues diſtant from the ſhoare, & *Cape Corientes* beyond *Cape bonæ ſpei*, which agree in the ſame variation: to wit, amounting to 7 Degrees 30 minutes: which notwithſtanding are diſtinguiſht by their ſeuerall declination: for howſoeuer the magneticall motion of variation being of late inuented, hath not ſo particularly beene traced out in all or moſt places, yet muſt the declination of each place needs be different; for as much as the former hath 23 degrees of South Latitude, the other none at all lying iuſt vnder the Equinoctiall: ſince the Latitude (as wee haue formerly taught) is in ſome meaſure proportionall to the Declination. For the third, if any two places bee found agreeing both in *Variation* and *Declination*, as may bee probably gueſſed of *Cape Roſſe* in S. *Iohns* Iland, and the weſt end of S. *Iohn de Porto Rico*: the Latitude being all one as of 17 degrees 44 minutes: and the variation admitting perhaps inſenſible difference, to wit, of a little more then one degree: yet might this helpe conioyned with former Trauellers report, or ſome ſmall obſeruation of heauenly bodies, or ſounding the bottome of the Sea, ſettle our opinion and make a plaine diſtinction.

2 *The* Declination *of any place being knowne the Latitude may alſo bee found out, although not without ſome errour.*

The ground of this Aſſertion we haue formerly handled in the Treatiſe of the Magneticall Affections of the Earth: where wee haue ſhewed that the Declination of the Magneticall needle is alwayes anſwerable in ſome proportion to the Latitude of the place: whence it muſt needs follow, that the declination any where being found out together with the proportion, the Latitude muſt needs be knowne. In this point I referre my Reader to D. *Ridleye's* late Treatiſe of Magneticall bodies and Motions, wherein hee by the helpe of M. *Briges*, hath calculated a certaine briefe table for this purpoſe. But that this manner of Inuention of the Latitude of a place, muſt needs admit of ſome errour, cannot well be denied; for as much as *Gilbert*, *Ridley*, and others, which haue written of this ſubiect; haue acknowledged this motion of Declination to bee in many places irregular, and not anſwerable in due proportion to the Degrees of Latitude, which diuerſe friends of mine, well experienced in magneticall experiments, haue to their great wonder confeſſed.

12 This much for the *Jnternall* Adiuncts The *Externall*, I call ſuch as are not impreſt into the Earth, but externally adjacent or adioyning vnto it. Here ought wee to conſider the *Aire* adioyning to any place with his Qualities and Proprieties.

13 The Ayrie properties of a place conſiſt in ſuch matters, wherewith the Ayre according to diuerſe places is diuerſly affected and diſpoſed.

In the Ayre we ought to note a twofold temper and quality, the one *Inbred* and *Eſſentiall*: the other *Externall* and *Accidentall*, The former, whether it bee heat ioyned with moiſture, as *Ariſtotle* affirmes, or cold ioyned with moiſture, as ſome others, I leaue it to the Naturall Philoſopher to diſpute. The latter being that to which our purpoſe is chiefly ingaged, and that no farther then may appertaine to the Topicall deſcription of a ſpeciall Countrey. Theſe accidents being ſo various and many, we are inforced to reduce them to a few generall heads which we will couch in this our Theoreme.

1 *The diſpoſition of the Ayre adjacent to a place depends chiefely on the Temperament of the Soyle.*

Thoſe things wherewith the Aëriall Region is affected, are of two ſorts; to wit, either the *Temperament* conſiſting in the mixture of the foure firſt *Qualities*; or elſe the bodies themſelues, as *Meteors* drawne vp into the Aire, whereof theſe accidentall diſpoſitions ariſe. That both theſe chiefly depend from the *Temperament* of the Earthly Soyle of a certaine place, many reaſons will demonſtrate: firſt that Meteors, whatſoeuer they are, take their originall from the Earth, is plaine. 1 Out of the name, which ſignifies things lifted vp, to ſhew that a Meteor is lifted and drawne out of the Earth. 2 Out of the materiall compoſition, which can no where elſe take this compoſition: For either wee ſhould deriue it from the *Heauens*, or from the *Ayre* it ſelfe, or from the *Fire*: From the Heauens it cannot take originall; becauſe it is corruptible, and therefore of no heauenly ſubſtance according to *Peripateticke* Philoſophie. Not from it ſelfe, becauſe the aire being ſuppoſed a ſimple and vncompounded body, cannot admit of ſuch mixture. Not from the *Fire*; firſt becauſe all Meteors partake not of fierie nature. Secondly, becauſe fire cannot well ſubſiſt, but of ſome matter whereon it may worke, and conſerue it ſelfe, which can bee no other then that which is of a glutinous ſubſtance: which wee no where finde but in the earthly Globe, conſiſting of Earth and Water; out of whoſe ſtore-houſes, the matter of all ſuch pendulous ſubſtances in the aire is deriued. Theſe Meteors may bee deriued from the Earth into the Aire, two manner of wayes. Firſt, *Directly* and immediatly, by an immediate aſcent or riſing of exhalations from ſome one particular place into the Ayrie ſpace right ouer it. Secondly, *Obliquely*, to wit, when Vapours, or other ſuch exhalations are by ſome violence or other carried from one place into another: as winde, which being ingendred in one place, continually bloweth into another. Againe, the former may happen two wayes: for either this riſing of Exhalations out of the Earth, is *Ordinary*, or *Extraordinary*: Ordinary I call that whereby the thinne parts of the water or Earth are continually ſpread and diffuſed through the whole Region of the Ayre: for wee cannot imagine otherwiſe then that at all times and places, the Terreſtriall Globe compoſed of Earth and Water, continually ſends and euaporates out ſome thinne or rarified parts, wherewith the earth is affected. Whether this Rarefaction or Euaporation of the water bee the true ſubſtance of the Aire it ſelfe (as ſome haue probably coniectured) or elſe ſome other body different from it, I will not here diſpute. This much will neceſſarily follow, that it proceeds originally from the Earth right vnder it. This vapour being ingendred from the water or moiſter parts of the Earth, is much varied and temper'd according to the place from which it ariſeth: For the matter of the Earth being various and diuerſe in diſpoſition, as well in regard of various veines of minerall ſubſtances, whereof it conſiſts, as of the firſt and ſecond qualities thereof ariſing, muſt of neceſſity cauſe the Aire about each Region to bee of the ſame quality. Whence a probable reaſon may bee ſhewne; why of two places, although both like in reſpect of the Heauens, and other circumſtances, one ſhould bee hot, the other cold; one healthie, another contagious; the one of a ſharpe and thinne aire, the other of a foggy & dull temper: For no queſtion but the minerall matter whereof the ſoile of the Earth conſiſts, being not euery where Solid and hard, but euery where intermedled with a vaporous and fluide ſubſtance, muſt needs challenge a great intereſt in the temperament of the Ayre, as that which is the firſt mother, if not of the Aire it ſelfe, yet at leaſt of the accidentall diſpoſitions thereof. The *Extraordinary* euaporations, I call ſuch as ariſe out of the Earth by ſome extraordinary concurſe of the Sunne, with ſome other Starres. Theſe are many times ſubiect to ſenſe, which happen not at all times and places: ſuch as are clowdes, windes, and ſuch like, which ariſe not naturally by their owne accord by a perpetuall emanation, but are by ſome greater ſtrength of the Sunne or Starres ratifying the parts of the earth, or water drawne vp to the Aire about it. Now for the Meteors *Indirectly* and obliquely belonging to any place, amongſt many other inſtances, we may bring the winde which bloweth from one Region to another; which according to ordinary experience partaketh of a twofold quality; the one deriued from the place whence it is ingendred; the other from the Region through which it paſſeth. Which may appeare by our foure Cardinall windes, as they are with vs in *England*, *Belgia*, and higher *Germany*. For firſt our Eaſterne winde is found to bee drieſt of all others, whereof no other cauſe can bee giuen, then that it comes ouer a great Continent of land lying towards the Eaſt, out of which many drie and earthly exhalations are drawn: ſo the Weſterne winde is obſerued to be very moiſt, becauſe it paſſeth ouer the hugie *Atlanticke* Ocean, which muſt needs caſt forth many watrie and moiſt vapours, which beget raine and ſhowres: from the moiſture of which Weſterne winde ſome haue ſought out an anſwer to that Probleme: why hunting hounds ſhould not ſent, nor hunt ſo well, the winde being in the Weſt, as at other times? For, ſay they, it is cauſed by the moiſture of it, either in making hinderance to their legges in running, or at leaſt to their ſmell, being very thicke and foggy. In this Weſterne winde we may alſo perceiue much cold, which is cauſed by the quality of thoſe watrie vapours, through which it paſſeth, which being drawne from the water, are naturally cold. In our South wind wee ſhall finde both heat and moiſture: whereof the former ariſeth from the Sunne, which in thoſe Southerne Regions neere the Equatour is moſt predominant; The latter from the naturall diſpoſition of the places becauſe before it approacheth our coaſts, it paſſes ouer the

Mediterranean Sea, out of which the Sunne begets abundance of watry vapours, which mixt themſelues with the windes. Finally the *North-winde* is obſerued to bee cold and drye. It muſt of neceſſity bee cold: becauſe it is carried ouer diuerſe cold and ſnowy places, moſt remote from the heat of the Sunne. It is drie; becauſe it paſſeth ouer many Ilands and dry places, ſending out ſtore of dry exhalations: as alſo becauſe the Sunne being very remote from thoſe Regions, fewer exhalations are drawne vp, which might infect it by impreſſions of their watrie quality. Theſe inſtances may ſerue to proue our aſſertion: That Meteors, wherewith the Aire is vſually charged, and by conſequence, their qualities impreſt into the Aire, are depending from the Earth, out of which they are drawne, either *Directly* from the ſame Region which they affect; or *Obliquely*, from ſome other Region remote from it. Howſoeuer, wee obſerue, that the diſpoſition of the Ayre depends from the Soile, wee cannot altogether exclude the Heauens, as ſhall bee taught hereafter in place conuenient.

CHAP. III.

Of the the Adiuncts of a place in reſpect of Heauens.

1 WE haue in the former Chapter ſpoken of the Adiuncts of a place in reſpect of it *Selfe*. We are now to proceed to ſuch Accidents as agree to a place, in reſpect of the *Heauens*.

2 The Adiuncts of the Earth in reſpect of the Heauens are of two ſorts; either *Generall* or *Speciall*.

Generall, I call ſuch as are abſtracted from any ſpeciall quality, or condition of the Earth, or any place in the Earth. Theſe accidents concerne either the *Situation* of the Inhabitants, or the *Diuiſion* of the places: both which we haue handled in our *Sphericall* part of *Geographie*: The *Speciall* are ſuch as concerne the nature of the place in reſpect of the Heauens, not *Abſolutely*, but *Reſpecting* ſome ſpeciall qualities or properties depending on ſuch ſituation; which more properly belongs to this part: For the vnfolding of which, before we deſcend to particularities, we will premiſe this one generall Theoreme.

1 *Places according to their diuerſe ſituation in regard of the Heauens, are diuerſly affected in quality and conſtitution.*

This Propoſition needs no proofe, as being grounded on ordinary experience: for who findes not betwixt the North and the South, a manifeſt difference of heat and cold, moiſture and drouth, with other qualities thereon depending, as well in the temper of the ſoyle it ſelfe, as the naturall diſpoſition of the inhabitants. Only three points will here require an expoſition: Firſt, by what *Meanes* and inſtruments the Heauens may bee ſaid to worke on the Earth. Secondly, how farre this operation of the Heauen, on the Earth may extend, and what limits it may ſuffer. Thirdly, how theſe operations are diſtinguiſhed one from the other. Concerning the firſt, wee are taught by our ordinary Philoſophers, that the Heauens worke on inferiour bodies by three inſtruments, to wit, *Light*, *Motion*, and *Influence*. By Light, as by an inſtrumentall agent, it ingendreth heat in the Aire and Earth; not that the light being in a ſort an Immateriall quality, can immediatly of it ſelfe produce heat, being materiall and elementary; But by attrition and rarefaction, whereby the parts of the aire being made thinner, approach neerer to the nature of fire, and ſo conceaue heat. This is againe performed two wayes; either by a ſimple or compounded beame. The ſimple Ray is weaker: The compounded inferring a doubling of the Ray by *Reflection*, is ſtronger and of more validity in the operation : and by conſequence ſo much the more copious in the production of heat , by how much more the reflection is greater : if wee meerely conſider it in regard of the Heauens , without any conſideration of the quality of the Earth. By motion the heauens may exerciſe their operation on the Earth two wayes. Firſt , by attenuating and rarefying the vpper part of the Aire next adioyning , turning it into *Fire*, (as ſome Philoſophers would haue it) whence the inferiour parts of the ayre communicating in this affection muſt needs partake ſome degrees of heat ; But this I hold to bee a conceit grounded onely vpon *Ariſtotles* authority ; who ſuppoſed the heauens to bee a ſolide compact body : which will not ſo ſoone bee granted of many more moderne Mathematicians. Secondly, the heauenly bodyes may bee ſaid to worke on inferiour things by motion ; in that by motion they are diuerſly diſpoſed and ordered to diuerſe Aſpects and configurations of the Starres and Planets , whereby they may produce diuerſe effects : ſo that in this ſenſe the heauens are imagined as a diſponent cauſe , which doth not ſo much produce the effects themſelues as vary the operation. Hereon is grounded all Aſtrologie , as that which out of diuerſe aſpects and combinations of the Planets and Signes foreſheweth diuerſe euents. The third Inſtrument , by which the Heauens are ſaid to worke , is the heauenly influence ; which is a hidden and ſecret quality not ſubiect to ſenſe , but only knowne and found out by the effects. This third agent being by ſome queſtioned , would hardly bee beleeued ; but that a neceſſity in nature conſtraines it. For many effects are found in inferiour bodies , cauſed by the heauens , which can no way bee aſcribed to the *Light* or *Motion*. As for example , the production of *Mettals* in the bowels of the earth , the *Ebbing* and *Flowing* of the Sea ; whereof neither the one or the other can challenge any great intereſt in the *Light* : For as much as the former is farre remote from the Sunne-beames : the other ceaſeth not to moue in his channell , when the Sunne and Moone are both vnder the Earth. Beſides , who can giue a reaſon of the exceſſe of heat in the *Canicular* or Dog-dayes , if hee exclude this influence ? For if wee conſider the Light of the

Sunne, wee ſhall finde it greater at the time of the *Solſtice*; the reflection being greater approaching neerer to right Angles. If wee conſider the Earth; wee ſhall finde no reaſon at all, why the heat ſhould be more predominant at this time then another. Then muſt wee of neceſſity aſcribe it to a ſpeciall *Influence* of the *Dog-ſtarre* being in coniunction with the Sunne. Many other Inſtances might bee here produced, but I hold it needleſſe, being a matter conſented to amongſt moſt Philoſophers. The ſecond point concernes the *Extent* and limitation of this operation in inferiour bodyes: for vnfolding of which point, wee muſt know that this operation may haue reſpect either to the Elements of *Earth* and *Aire*, or elſe to the Inhabitants reſiding on the Earth. For the operation of the Heauens vpon the Elementary maſſe, experience it ſelfe will warrant; yet with this limitation, that this operation is meaſured and ſquared according to the matter whereinto it is receaued: as for example, wee ſhall finde the *Moone* more operatiue and predominant in *moiſt* Bodyes, then in others, partaking leſſe of this quality. Likewiſe the heat cauſed by the Sunne more feruent where it meets with a ſubiect which is more capable. Whence it comes to paſſe that one Countrey is found hotter then another, although ſubiect to the ſame Latitude in reſpect of the Heauens: for howſoeuer the action of the Heauens bee alwayes the ſame and vniforme in reſpect of the Heauen it ſelfe, yet muſt the ſame bee meaſured and limited according to the ſubiect into which it is impreſt. For the Inhabitants, wee are to diſtinguiſh in them a twofold nature: the one *Materiall* as partaking of the Elements, whereof euery mixt body is compounded. The other ſpirituall, as that of the Soule. The former wee cannot exempt from the operation of the Heauens: for as much as euery Phyſician can tell how much the humours and parts of our body are ſtirred by celeſtiall influence, eſpecially by the *Moone*, according to whoſe changes our bodies dayly vndergoe an alteration. For the humane ſoule, how farre it is gouerned by the ſtars is a matter of great conſequence; yet may wee in ſome ſort cleere the doubt by this one diſtinction. The Heauens may bee ſaid to haue an operation vpon the ſoule two manner of wayes.

Firſt, *Immediatly* by it ſelfe. Secondly, *Mediately* by the humours and corporeall organes, whereof the Soules operation depends. The firſt wee abſolutely deny; for the ſoule being an immateriall ſubſtance, cannot bee wrought vpon by a materiall agent, as Philoſophers affirme: for the ſecond, it may bee granted without any abſurdity: For the operation of the ſoule depends meerely on materiall and corporeall organes. The Elementary matter, whereof theſe organes conſiſt, are ſubiect to the operation of the Heauens, as any other Elementary matter. So that wee may affirme the Heauens in ſome ſort to gouerne mens mindes and diſpoſitions, ſo farre forth as they depend vpon the bodily inſtruments. But here wee muſt note by the way, that it is one thing to inferre a *Neceſſity*; another thing to giue an *Inclination*. The former we cannot abſolutely auerre; for as much as mans will, which is the commandreſſe of his actions, is abſolutely free not ſubiect to any naturall neceſſity, or externall coaction. Yet can wee not deny a certaine inclination; for as much as the ſoule of a man is too much indulgent vnto the body, by whoſe motion it is rather perſwaded then commanded. The third point we haue in hand, is to ſhew how many wayes the Heauens by their operation can affect and diſpoſe a place on the Earth. Here wee muſt note that the operation of the Heauens in the Earth is twofold; either ordinary or extraordinary. The ordinary is againe twofold; either *variable* or *Inuariable*. The variable I call that which is varyed according to the ſeaſon, as when the Sunne by his increaſe or decreaſe of heat, produceth *Summer* or *Winter*, *Spring*, or *Autumne*: which operation depends from the motion of the Sunne in his *Eclipticke* line, wherein hee comes ſometimes neerer vnto vs, ſometimes goeth further from our verticall point. The Inuariable, I call that, whereby the ſame places are ſuppoſed to inioy the ſame temperament of heat or cold without any ſenſible difference in reſpect of the Heauens; putting aſide other cauſes and circumſtances: for howſoeuer euery Region is ſubiect to theſe foure changes, to wit, *Summer*, *Winter*, *Spring*, and *Autumne*: yet may the ſame place inioy the ſame temperament of Summer and Winter one yeere as it doth another without any great alteration: and this depends from the ſituation of any place neerer or farther of in reſpect of the *Equinoctiall* circle. The *Extraordinary* operation of the Heauens depends from ſome extraordinary combination or concurſe of Planets particularly affecting ſome ſpeciall place; whence the cauſe may bee probably ſhewed why ſome place ſhould ſome yeeres proue extraordinary fruitfull, other times degenerate againe to barrenneſſe: or why it ſhould ſometimes bee moleſted with too much drouth, and other times with too much moiſture. To let paſſe the other conſiderations as more appertaining to an *Aſtrologer* then a *Geographer*, wee will here onely faſten on the *Inuariable* operation of the Heauens on earthly places; and ſearch how farre forth the places of the Earth are varied in their Temper & Quality, according to their diuerſe ſituations, and reſpect to the Equinoctiall circle; taking onely notice of the Diurnall and ordinary motion of the Sunne in his courſe. Herein ſhall wee finde no ſmall variety, not onely in the temper of the Ayre, but alſo in the diſpoſition and complection of the Inhabitants: both which we ſhall more ſpecially declare: the former in this Chapter; the other in due place: wherein we ſhall haue occaſion to treat of the materiall conſtitution and manners of diuerſe Nations.

2 In reſpect of the Heauens, a place may be diuided two wayes: Firſt, into the *North* and *South*. Secondly, into the *Eaſt* and *Weſt*.

3 Any place is ſaid to be *Northerne* which lyeth betwixt the *Equatour* and *Arcticke Pole*. *Southerne*, betwixt the *Equatour* and the *Antarcticke-Pole*.

The whole Globe of the Earth (as we haue formerly taught) is diuided by the Equatour into two Hemiſpheares; whereof the one is called Northerne, lying towards the Northerne or Arcticke Pole: the other towards the other Pole is called the

Southerne. But here to cleere all doubt, wee muſt vnderſtand that a place may be ſaid to be Northerne or Southerne two manner of wayes: either *Abſolutely* or *Reſpectiuely*: Abſolutely Northerne and Southerne places are tearmed, when they are ſituated in the *Northerne* or *Southerne* Hemiſpheares, as wee haue taught in this Definition; But ſuch as are Reſpectiuely Northerne, may be vnderſtood of ſuch Regions, whereof the one is ſituate neerer the Pole, the other neerer the Equatour. In the firſt place here wee are to conſider a place as it is abſolutely taken to be either North or South: Concerning which we will particularly note theſe two Theoremes.

1 Northerne *and* Southerne *places alike ſituate, generally inioy a like diſpoſition.*

Wee haue formerly granted to euery Region or Countrey a ſpeciall quality or temper: although lying or ſituate vnder the ſame Latitude. But here excluding all concurrent cauſes which may vary the temper of the Soile, wee conſider the diſpoſition of a place ſo farre forth as it depends on the *Heauenly Influence* or operation. In which ſenſe we cannot deny to a place of like ſite, a like nature, for as Philoſophers vſe to ſpeake, *Simile qua ſimile ſemper aptum natum eſt ſimile producere*: Like cauſes alwayes produce like effects: ſo the Heauens in like diſtance, being diſpoſed alike as well in regard of *Light* as *Influence*, cannot but affect thoſe parts of the Earth in the ſelfe-ſame manner. For the Inſtruments by which the heauens worke on inferiour bodies (as we haue ſhewed) are *Light* and *Influence*. For both the Light and Influence, it is certaine that in places of equall Latitude and reſpect to the Equatour, it is caſt equally: both the one and the other being imagined to bee carried in direct lines or beames, which with the *Horizon* makes like Angles. Now that the validity or weakneſſe of the operatiue Rayes is to bee iudged according to the *Right* or *Oblique* incidency, making right or oblique Angles, no Mathematician will gaine ſay. But here we muſt note by the way, that wee only conſider the Heauen according to his generall Influence or operation depending chiefly on the Sunne: not of the ſpeciall operation of ſpeciall Starres, for it may be ſome particular conſtellations in the Northerne Hemiſpheare may bee indowed with ſome ſpeciall influence, which is not found in the Southerne; or the South in this kinde goe beyond the North. But this kinde of Influence is rare and hard to finde, by reaſon of the various mixture of diuerſe conſtellations in their operation in the ſame ſubiect: and howſoeuer it were well knowne, yet it is not ſo notable to take place before this common Rule, which wee ſhall finde to take place, if not exactly, yet commonly throughout the whole Terreſtriall Spheare. Thus *Bodin* ſhewes a great likeneſſe betwixt the higher *Germany*, and the kingdome of the *Pantagones*, in the South part of *America*, out of the great *Stature* of the Inhabitants, which muſt needs proceed out of the nature of the places, which are found to be ſituate very neere vnder the ſame *Parallell*. The like correſpondency haue wee noted betwixt *Guinea* in *Africke* and that part (as it is thought) of the *South Continent*, which they haue for this cauſe tearmed *Noua Guinea*: many more Parallells in this kinde might be found out; but theſe may ſuffice in ſo euident a matter.

2 *The Northerne Hemiſpheare is the* Maſculine, *the Southerne the* Feminine *part of the Earth.*

It hath beene a vſuall kinde of ſpeech amongſt men to tearme ſuch things as are ſtronger, worthier, or greater, *Maſculine*: on the contrary ſide ſuch things *Feminine* as are found deficient and wanting in theſe perfections: by which kinde of Metaphor taken from the Sexes in liuing creatures they haue aſcribed to the Northerne Hemiſpheare a Maſculine Temper in reſpect of the Southerne, which comes farre ſhort of it: for howſoeuer no cauſe can bee ſhewed in regard of the Heauens (as is taught in our former propoſitions) except by ſome ſpeciall conſtellations of the South, which is full of vncertainty, and as ſoone denied as affirmed; yet comes it to paſſe by ſome hidden propertie of the places themſelues, or at leaſt ſome caſuall Accident or other, that theſe two Hemiſpheares ſuffer a great and notable diſparity. For againſt the large and fertill Territories of the Northerne Hemiſpheare containing in it wholy *Europe* and *Aſia*, with the greateſt part of *America* and *Africa*, wee ſhall finde (beſides ſome few ſcattered Ilands) only three continents to oppoſe, to wit, a ſmall part of *Africke*, the greateſt part of *America Peruana*, containing in it *Peru*, *Braſile*, and the Region of the *Pantagones*, and the South continent called *Terra Auſtralis Incognita*, and by ſome others, the *South Indies*. For the former lying neere the *Cape of good hope*, if we will credit the relations of our owne Merchants, we ſhall finde the aire by reaſon of heat, very diſtemperated, ſituat betwixt the Equatour and the Tropicke of *Capricorne*: The land very barren, the Inhabitants of a brutiſh diſpoſition, wanting (as it were) all ſenſe of ſcience or religion: bearing heauy as yet the curſe of *Noah*, the firſt Father of that *African Nation*. For *America Peruana* wee ſhall finde it perhaps more happy in reſpect of the Soyle, although little better in reſpect of the Inhabitants. Yet for the plentie of Gold-mines, whereof they can chiefly vaunt, wee ſhall finde it farre ſurmounted by the *Eaſt Indies*, or at leaſt paralelled by *America Mexicana*, lying on this ſide the *Equinoctiall circle*. For other commodities, as *Cattle*, *Fruits*, *Herbage*, *Spices*, *Gummes*, and other medicinable roots, and mineralls, leſſe queſtion can be made, as being farre inferiour to *Europe*, *Aſia*, *Mexicana* and other Regions included within our Northerne partition. Of the third and greateſt, which is the South continent, no coniecture can be well grounded, being in a manner all vndiſcouered, except ſome ſmall quillets on the borders of it: by which, if wee may iudge of all the reſt, wee ſhall almoſt giue the ſame iudgement, as of the other. The want of diſcouery in this age of ours, wherein Nauigation hath beene perfected and cheriſhed, is no ſmall argument to proue it inferiour in commodities to other places: Neither had the ſlackneſſe of the *Spaniard* giuen that occaſion of complaint to *Ferdinand de Quir*, the late diſcouerer of ſome of theſe parts, had not the *Spaniſh* King thought ſuch an expedition either altogether fruitleſſe, or to little purpoſe. For who knowes not the *Spaniard* to bee a Nation as couetous of richeſſe as ambitious to purſue forraine Soueraignty: as ſuch who will more willingly expoſe the liues of their owne ſubiects, then looſe the leaſt title ouer other Countreyes. This may bee a probable argument, that this Continent hath not as yet ſo well ſmiled on the ambition of this prowd Nation, as ſome other conqueſts. For *Politicall* and *Martiall* affaires, how farre ſhort it comes of our Northerne Hemiſpheare, I ſhall ſpeake in due place, where I ſhall handle the naturall diſpoſition of diuerſe Inhabitants according to their ſituation. To finde out the true cauſes of this diuerſity, is very difficult: To ſeeke a reaſon in ſome particular conſtellation, and influences in the Heauens, or ſome ſpeciall diſpoſition of the ſoyle, is too generall to giue ſatisfaction, and too vncertaine to inforce credulity. Yet putting theſe aſide, I can only gueſſe at two reaſons, which are accidentall, yet ſtrengthned with good probability. The firſt and greateſt is that bitter curſe caſt on *Cham* and his poſterity by his father *Noah*, which no doubt was ſeconded by Gods dipleaſure taking place in his habitation. That all theſe Nations ſprung from *Cham*, I dare not confidently auouch: Yet for the moſt part, it is probable they were of this Race. For the *Africans* it is out of queſtion, as warranted by the holy Scripture: and it is not vnlikely that many of thoſe Southerne people fetcht their firſt originall from them. The ſecond cauſe may bee drawne from the *Induſtrie* and labour of the inhabitants in tillage and manuring of the ground, wherein the Southerne inhabitant hath beene more deficient. For it is certaine out of the holy Scripture that *Noahs* Arke, wherein was the Seminary of mankinde, and almoſt all other liuing creatures, reſted in the Northerne part of the world: whence both man and beaſts beganne to be propagated toward the South, no farther then neceſſity enforced: the Regions inhabited growing daily more and more populous, and (as it were) groaning to bee deliuered of ſome of her children. Hence may bee inferred two conſectaries. Firſt, that the Northerne Hemiſpheare was inhabited ſooner, and is now therefore more populous then the Southerne. Secondly, that the chiefeſt and principall men, which were beſt ſeated rather choſe to keepe their ancient habitation, ſending ſuch abroad, who could either bee beſt ſpared, or had the ſmalleſt poſſeſſions at home. Yet notwithſtanding it cannot be imagined but they retained with them a ſufficient company and more then went away. Out of which it muſt needs be granted, that the *Northerne* halfe of the Earth being beſt inhabited, ſhould be beſt manured and cultured; from whence the ground muſt in time proue more fruitfull and commodious for habitation: for as a fruitfull Countrey for want of the due manuring and tillage doth degenerate and waxe barren, ſo diuerſe barren and ſterill Countreyes haue by the induſtrie of the Inhabitants beene brought to fertilitie, and made capable of many good commodities neceſſary for mans life. If I were curious to draw arguments from the nature of the Heauens; I could alleage the *Greatneſſe* and *Multitude* of Starres of the greater magnitude in our Northerne Hemiſpheare, wherein the Southerne is deficient, as alſo the longer ſoiourning of the Sun in our Northerne Hemiſpheare: but theſe as vncertaine cauſes I paſſe ouer. Other reaſons may perchance bee found out by thoſe who are inquiſitiue into the ſecrets of nature, to whom I leaue the more exact ſearch of theſe matters.

4 Either Hemiſpheare conſiſting of 90 Degrees may be diuided into three parts, each of them containing 30 Degrees.

5 Of theſe parts 30 we allot for Heat, 30 for Cold, and 30 for Temperature: whereof the former lyeth towards the Equatour, the ſecond towards the Pole; the third betwixt both.

The ancient Coſmographers (as wee haue ſhewed in our former Treatiſe) diuided the whole Globe of the Earth into fiue *Zones*, which they ſuppoſed had alſo proportionally diuided the Temper and diſpoſition of the Earth. In ſuch ſort that according to the Degrees of Latitude the Heat and Cold ſhould increaſe or diminiſh. Which rule of theirs had beene very certaine, were there no other cauſes concurrent in the diſpoſition of the Earth and Ayre, but onely the Heauens. But ſithence that many other concurrent cauſes, as we haue ſhewed, mixe themſelues with theſe celeſtiall operations, and the experiment of Nauigatours haue found out a diſproportion in the quality, in reſpect of the Diſtance, ſome later writers haue ſought out a new pertition more conſonant to naturall experience. The whole Latitude of the Hemiſpheare conſiſting of 90 Degrees from the Equatour to the Pole, they haue diuided into three parts, allowing 30 Degrees toward the Equatour to Heat; 30 Degrees towards the Pole to Cold; and the other 30 Degrees lying betwixt both to Temperature. Theſe 30 Degrees for Imagination ſake they haue ſubdiuided againe, each of them into two parts contayning 15 Degrees a peece: more particularly to deſigne out the ſpeciall diſpoſition of each Region, lying either Northward or Southward from the Equatour, which is the bound betwixt both Hemiſpheares. In the firſt ſection of 30 Degrees lying Northward from the Equatour, wee comprehend in *Africke*, *Numidia*, *Nigritarum Regio*, *Lybia*, *Guinia*, *Nubia*, *Egypt*, *Ethiopia ſuperior*. In *Aſia*; *Arabia*, *India*, *Inſulæ Philippinæ*. In *America*, *Noua Hiſpania*, *Hiſpaniola*, *Cuba*, with other parts of *America Mexicana*. In the other extreame ſection from 60 Degrees of Latitude to the *Pole*, wee comprehend in *Europe*, *Groenland*, *Iſland*, *Frieſland*, *Norwey*, *Suethland* for the moſt part, *Noua Zembla*. In *Aſia*, a great part of *Scythia Orientalis*. In *America*, *Anian*, *Quivira* with diuerſe other parts of the North of *America Mexicana*. In the middle betwixt both, betwixt 30 and 60 Degrees of Latitude wee comprehend in *Africa*, *Barbarie*; in *Europe*, all the kingdomes except thoſe North Prouinces before named, and almoſt all *Aſia*, except ſome places toward the South, as *Arabia*, *India*, and the *Philippinæ Inſulæ*, formerly placed in the firſt Section; In like manner may we diuide the Southerne Hemiſpheare into three Sections: In the firſt, from the Equatour 30 Degrees we place in *Africke*, *Congo*, *Monomotapa*, *Madagaſcar*: In the Southerne Tract, *Beach*, and *Noua Guinia*, with many ny Ilands thereunto adioyning, as many of the *Philippinæ Inſulæ*, with *Inſulæ Solomonis*. In *America*, *Peru*, *Tiſrada*, *Braſilia*, with the moſt part of that Region which they call *America Peruana*. In the other extreame Section from 60 Degrees to the Antarctike Pole, is couched the moſt part of that great land ſcarce yet diſcouered, called *Terra Auſtralis Incognita*. In the middle Region betwixt both, from 30 to 60 Degrees, ſhall wee finde placed in *America*, the Region of the *Pantagones*, in the Southerne Continent, *Maletur*, *Iauaminor*, with many others. In diſcouering the qualities of theſe ſeuerall Sections or partitions of the earth, our chiefeſt diſcourſe muſt be addreſſed to the Northerne Hemiſpheare, as that is more diſcouered and knowne amongſt old and new writers; by which according to the former Propoſition one may parallell the other; concerning which wee will inferre theſe Propoſitions.

1 *In the firſt Section of the Hemiſpheare the firſt 15 Degrees from the* Equatour *are found ſomewhat* Temperate; *the other 15 about the Tropicks exceeding Hot.*

That the Region lying vnder the Equatour is Temperately hot, contrary to the opinion almoſt of all the Ancients, hath beene in part proued heretofore, as well by reaſon, as experiment: for that all places by how much the neerer they approach the Equatour, by ſo much more ſhould bee hotter (as ſome imagine) diuerſe inſtances will contradict. It is reported by *Aluarez* that the *Abyſſine Embaſſadour* arriuing at *Lisbone* in *Portugall*, was there almoſt choaked with extreame heat. Alſo *Purquer* the Germane, relates that hee hath felt the weather more hot about *Dantzicke*, and the *Balticke* Sea, then at *Tholouſe* in a feruent Summer. The cauſes which wee haue before touched, are chiefly two. The firſt is, that the Sun is higher in this orbe in reſpect of thoſe vnder the Equatour, and moueth more ſwiftly from them, ſpending on them onely twelue houres, whence ſo great an impreſſion of heat cannot bee made as in other places: for heat being a materiall quality, muſt neceſſarily require ſome Latitude of time to bee impreſt into the ayre, or any other ſubiect. From the Diminution of heat in the Region muſt the ayre needs receaue into it ſelfe the contrary quality of cold. An argument of cold may bee drawne from the teſtimony of *Alvarez*; who affirmes the waters there in the month of Iune, to bee frozen ouer with Ice, the South winde blowing. The ſecond cauſe is by iudicious writers, aſcribed to the ſubtility and rarity of the Aire vnder the Equinoctiall line, which cannot receaue into it ſelfe ſo many degrees of heat as the thicke and groſſe aire of diuers places diſtant. For the North Region, wherein *Europe*, and a great part of *Aſia* is placed; is for the moſt part full of waters, which burſting out of ſecret and vnknowne concauities, doe produce infinite *Fennes*, *Gogges*, *Lakes*, and *Mariſhes*, which in the Summer ſeaſon cauſe infinite vapours to abound, which being intermixed with heat, ſcorch and heat more feruently then the purer ayre of *Africke*, being for the moſt part free from the mixture and concurſe of ſuch ſlimie vapours. That the aire being thickned ſhould yeeld a greater feruour, euery man out of ordinary experience can frame to himſelfe an argument: For wee ſee Fire and Heat being incorporated (as it were) in the Steele or Iron, to burne and heat more then in Aire or Wood. The like reaſon ſome would draw from the keepers of Stoues or Hot-houſes, which doe beſprinkle the ground with water, that the vapour being contracted and the aire thickned, they may the longer and better maintaine heat, and ſpare Fuell. Another cauſe (which we haue formerly touched) may bee drawne from the *Set* and Anniuerwindes which blow moſt part of the yeere one way. *Ioſephus Acoſta* obſerues that betwixt the Tropicks, the winde is for the moſt part Eaſterly, beyond Weſterly: and a Dutch-diſcouerer hath related that in *Guinea* they haue a certaine winde which comes from the land till noone: and then very violent from the Sea, in ſo much as the Inhabitants are wont to trafficke in the morning being not able to indure it: which if it bee true wee cannot imagine this Region to bee ſo hot as men ſuppoſe. For here the heat in the night is aſſwaged, by the abſence or remoteneſſe of the Sunne: Likewiſe the exceſſe of heat incident to noonetide, is much qualified (or as it ſhould ſeeme by this relation) altogether vanquiſhed by the cold winde deriued from the Sea. Another reaſon no leſſe probable may be deriued from the exceſſiue height of the land and great mountaynes, obſerued to bee neere or vnder the line, whoſe tops are alwayes couered with Snow, which giue a ſufficient teſtimony of cold. For inſtance, wee need goe no farther then the ridge of the mountaines *Andi* in *America*, where they obſerued the Ayre to be ſo thinne and cold, that it inforced them to ſcowre and vomit, which came neere it. The like whereof is related of another called *Punas*, where the extremity of cold cutteth off their hands: From which experience wee may finde ſome places neere the Line to bee more infeſted with cold then heat. The laſt and greateſt reaſon may bee taken from the continuall moiſture wherewith the regions ſituate betwixt the Tropicks frequently abound. This moiſture is deriued from two cauſes; 1 From the melting of the Snow on the tops of the mountaines by the Sunne, which running from thence continually into the vallies, keepe them almoſt alwayes watriſh, eſpecially in the midſt of Summer when the Sunne is neereſt. 2 From the extreame heat of the Sunne, which being very neere, and many times verticall, rayſeth vp continually moiſt vapours in great quantity. Theſe vapours in ſo ſhort a time as 12 houres, being not conſumed but meeting with the cold from the middle Region of the aire, are therewith conuerted into drops, which fall downe againe in great ſhowres: in ſo much as ſome trauellers of good credit haue told me, that all the while they ſayled betwixt the Tropicks, they ſeldome ſaw the Sunne, by reaſon of raine and clowdy vapours. Whence wee note with *Ioſephus Acoſta*, by way of conſectary, that the preſence of the Sunne betwixt the Tropicks produceth moiſture, but contrariwiſe without the Tropicks, it is the cauſe of drouth: whence the inhabitants inioy as it were a Winter, when the Sun is to them verticall, becauſe of the diſtemperature by Windes, Raines, and Stormes, and great Inundations, whereunto commonly all great riuers betwixt the Tropicks are moſt ſubiect. Alſo they ſeeme to haue a Summer, when the Sunne is in or neere the Tropicks becauſe being ſomewhat remoued, he cannot bee ſo powerfull in drawing ſuch ſtore of vapours and exhalations which hee can diſpell and conſume. Thus wee ſee the moity of this firſt Section lying 15 degrees from the Equatour, howſoeuer ſubiect to a greater reflection of the Sunne-beames, yet through the concurrence of other cauſes to bee found indifferently Temperate, and the other 15 degrees about the Tropicks, howſoeuer ſubiect to a leſſer Reflection to bee exceſſiue hot: which later cauſe, beſides all which hath beene ſaid before, ſhall bee further confirmed hereafter by the complection of the natiue Inhabitants, which wee ſhall finde to bee *Choller-aduſt*, the true ſymptome of an externall heat. But if any man ſhall anſwer that this accident is incident as well to the Regions ſituate vnder the Equatour, as to that vnder the Tropicks; I will produce another reaſon drawne from the colour of their conntenances; which vnder the Equatour is not ſeene ſo blacke and ſwarthie as elſewhere. For toward the Tropicke, is placed the Land of *Blackmores* or *Nigritarum Regio*, where the people are all coleblacke: which might perhaps happen alſo to thoſe that dwell vnder the other Tropicke; but that other cauſes interpoſe themſelues, which hinder the exceſſe of heat, which is taken to be the chiefe cauſe of this blackneſſe; Here ſome would oppoſe the opinion of *Herodotus*, which referred the cauſe of this blackneſſe in the Negroes, to the *Seed* which hee would haue to bee blacke: others would haue this blackneſſe as a curſe inflicted vpon *Chams* poſterity: but theſe opinions carry very little ſhew of probability. For firſt, if this former opinion were admitted, it would of neceſſity follow (ſaith *Boden*) that *Ethiopians* in *Scythia* ſhould alwayes bee borne blacke, and *Scythians* in *Ethiopia* ſhould bee alwayes white. For as much as all nations from the beginning of the world haue beene confuſed and mixt by the diſtinction of Colonies: but experience teacheth vs, that men traſplanted into another Soyle, will in manner of trees and Plants by little and little degenerate and change their firſt diſpoſition. As if a *Blackmore* marry and beget children here with vs in *England*, experience will plainely declare the children to be more inclining to whiteneſſe then the fathers and the grand children more then them. Secondly, if the ſecond opinion of *Chams* curſe deſerued any credit; I ſee no reaſon why all his poſterity (ſuch as by moſt writers conſent, are generally the people of *Africke*) ſhould not bee ſubiect to the ſame execration, as well as one little parcell of it. Moreouer it is reported by *Pline*, and confirmed by *Appian*, that in thoſe places are many blacke Lions, which we can aſcribe to no other cauſe then the exceſſe of heat, and not to any quality of the Seed, or any curſe inflicted on the place: Moreouer it is reported by *Ferdinando de Quir* in his late diſcouery of the South Continent, that hee there alſo found ſome blacke people; yet can wee not imagine this Land, though ſtretching very farre in quantity toward the Equinoctiall, to come ſo farre or much farther then the Tropicke of *Capricorne*. Theſe arguments make it the more probable that the Regions ſituate vnder the Tropicks, generally exceed more in heat, then thoſe placed in the middle of the Earth vnder the Line.

2 *In the other extreame Section from 60 Degrees towards the Pole, the firſt 15 Degrees towards the Equatour are more moderately cold; the other towards the Pole moſt immoderately cold, and vnapt for conuenient Habitation.*

That this Section of 30 Degrees comprehended betwixt the 60 Degree and the Pole, is in a ſort habitable, is confirmed by the teſtimony of many Nauigatours, eſpecially the *Engliſh* and *Hollanders*; who haue aduentured very farre Northward, and haue there found the Earth, though not ſo fruitfull, yet furniſhed with ſome commodities, and peopled with Inhabitants. The firſt 15 Degrees towards the Equatour admit of no great exception, containing in their extent *Finmarke, Bodia*, in *Scandia, Noua Zembla, Anian, Groenland*, with many other places indifferently diſcouered: where they haue indeed found the aire very cold in regard of this of ours: Yet not ſo Immoderate, but that it can at all times agree with the naturall temper of the natiue Inhabitants, and at leaſt at ſome times of the yeere admit a paſſage for forraigne Nations. But the other Region ſtretching Northward from 75 Degrees to the Pole it ſelfe, howſoeuer it may bee probably thought habitable, yet affords it no conuenient meanes and ſuſtenance for mans life, in reſpect of other places; neither can the people of this climate inioy any good complection or Temperament of the foure qualities; for as much as the cold with them is ſo predominant, that it choaketh, and almoſt extinguiſheth the naturall heat: whence *Hypocrates* ſaith that they are dryed vp, which is a cauſe of their ſwarty colour, and dwarfiſh ſtature; which aſſertion of his can obtaine no credit, but of ſuch Northerne people as liue neere the Pole; Neuertheleſſe wee ſhall not finde theſe poore Northerne Nations, ſo deſtitute altogether of vitall aides, but that their wants are in ſome ſort recompenſed by the benefit of nature. The chiefeſt comforts in this kinde, which wee inioy, and they ſeeme to want, are *Heat* and *Light*. The defect of heat is ſomewhat mollified; 1 By the Sunne ſtaying ſo long aboue their Horizon as 6 months, and by conſequence impreſſing into the Aire a greater degree of heat. 2 By the naturall cuſtome of the Inhabitants, neuer acquainted with any other temperature: both which reaſons wee haue formerly alleaged. 3 By the induſtrie of the Inhabitants, being taught by neceſſity to preſerue themſelues during the Winter-time in *Caues*, *Stoues*, and ſuch like places heated with continuall fires: the defect of which prouidence, was thought to bee the ruine of Sr *Hugh Willoughby*, intending a ſearch of the North-eaſt paſſage on the North of *Lapland* and *Ruſſia*. To recompenſe the defect of Light, Nature hath prouided two wayes: 1 In that the Sunne in his Parallell comming neerer and neerer to the Horizon, giues them a long time of glimmering light both before his riſing and after his ſetting: which may ſerue them inſteed of day. 2 For that the Sunne and Starres by reaſon of a refraction, in a vaporous and foggy Horizon, appeares to them ſometime before hee is truly riſen: which cauſed the *Hollanders* *Noua Zembla*, to wonder why they ſhould ſee the Sunne diuerſe dayes before according to their account hee was to riſe aboue their Horizon according to Aſtronomicall grounds: which probleme had ſtaggered all the Mathematicians of the world, had not the Perſpectiue ſcience ſtept in to giue an anſwer.

3 *In the middle Section betwixt* 30 *and* 60 *Degrees of Latitude, the firſt* 15 *are Temperately* Hot, *the other* 15 *more inclined to* Cold.

The middle Region partakes a mixture of both extreames, to-wit, of the cold Region towards the Pole, and the hot towards the Equatour: whence it muſt needs follow, that the more any parts of this Tract approach the hot Region vnder the Tropicke and Equatour, the more it muſt partake of Heat: yet this heat being mittigated by ſome cold by reaſon of the ſite of the Sunne, it muſt of neceſſity bee Temperate and very apt for humane habitation. Alſo this mixture of the cold quality being more extended and increaſed on the other moity towards the Pole through the vicinity of the cold Region, muſt looſe much of the former heat, which ſhall hereafter bee more confirmed out of the naturall conſtitution and complection of the Inhabitants; bearing the true markes of externall cold and internall Heat, whereof the one is ſtrengthened by the other: For the externall cold, if it be not ouer predominant, and too much for the internall Heat, will by an *Antiperiſtaſis* keepe in and condenſate this heat, making it more feruent and vigorous.

6 The Eaſt and Weſt Hemiſpheares are bounded and diuided by the Meridian paſſing by the *Canaries* and the *Molucco* Ilands.

7 The Eaſt Hemiſpheare reacheth from the *Canaries* the *Moluccoes* on this ſide; as the other on the oppoſite part of the Spheare.

Wee may here note a great difference betwixt this diuiſion and the former. For the North and South Hemiſpheares being diuided by the Equatour, are parted (as it were) by Nature it ſelfe, and the Sunnes motion; But the diuiſion of the Globe into Eaſt and Weſt, wee can aſcribe to no other cauſe, then mans Inſtitution: yet are the Eaſterne and the Weſterne found to differ many wayes, the diſcouery of which may giue great light to obſeruation.

1 *The* Eaſterne *Hemiſpheare wherein we liue is euery way happier and worthier then the other* Weſtward.

How farre ſhort the Weſterne Hemiſpheare comes of this of ours, many circumſtances may declare. For firſt, if we compare the Quantity of Land, wee ſhall finde a great diſparity. For the Weſterne Hemiſpheare containes in it beſides the Southerne Continent (wherein ours alſo claimes a moity) onely *America*, with the Ilands thereunto adioyning: whereas the other within this large circuit containes all the other parts of the Earth knowne vnto the Ancients, as *Europe*, *Aſia*, and *Africke*, with many Ilands to them annexed. Moreouer it is probably conjectured by ſome, that *America* is vſually on our Mappes and Globes, eſpecially the more ancient, painted and delineated out greater then indeed it is: which hath beene aſcribed to the fraudulent deceit of the *Portugalls* heretofore; who to the end they might reduce the *Molucco* Ilands to the *Eaſt Indies*, then their owne poſſeſſion; ſought as well in their Mapps as relations to curtaile *Aſia*, and inlarge *America* in ſuch ſort, as the *Molucco* Ilands might ſeeme to fall within the 180 Degrees Eaſtward, wherein they fed themſelues with vnknowne ſubſtance, and the *Caſtilians* with painted ſhadowes. But to let paſſe the quantity as a matter of leſſe moment and leſſe queſtioned; a great diſparity will bee found in the *Quality* and *Diſpoſition*: For what one commodity almoſt was euer found in this Continent, which is not onely parallelled, but ſurmounted by this our Hemiſpheare? If we compare the Mines of Gold and Siluer wherein conſiſts the wealth and riches of both places; our *Eaſt*

Indies will eaſily challenge the ſuperiority. If *Trees*, *Plants*, *Herbage* and *Graines*, let our Phyſicians and Apothecaries iudge, who owe moſt of the medicinable drugges to *India*: Let our Merchants anſwer, which owe their Spices to *Arabia*, their Wine, to *Spaine*, *Italy*, the *Mediterranean*, *Græcian*, and *Indian* Ilands; their Silkes, Linnen, Cloathing, and their furniture almoſt wholly to *Europe*. If wee compare the multitude and various kindes of Beaſts bred and nouriſhed in either place, no queſtion but *Europe*, *Aſia*, and *Africa* can ſhew farre greater Heads of *Sheepe*, *Cattle*, and ſuch like, with farre greater variety of kindes, then euer were found in this new found Continent. If all theſe failed, yet the well tempered diſpoſition of the *Europæans* and *Aſians* in reſpect of this barbarous and vnnurtured place, diſdaines all compariſon: where wee ſhall obſerue on the one ſide a people long ſince reduced to ciuility, inſtructed as well in liberall ſciences, as handy-crafts, armed with martiall diſcipline, ordered by Lawes and ciuill gouernment, bound with a conſcience and ſenſe of Religion; on the other ſide a multitude of miſerable and wretched nations, as farre diſtant from vs in *ciuility*, as *place*; wanting not only *Gouernment*, *Arts*, *Religion*, and ſuch helps, but alſo the deſire, being ſenſeleſſe of their owne miſery.

2 *The difference of* Eaſt *and* Weſt *cannot worke a diuerſitie in two places by any diuerſity of the Heauens.*

Eaſt and *Weſt* places compared together, are either of equall or vnequall Latitude. For places of vnequall Latitude no queſtion can bee made, but they receaue a greater variety of Temper from the Heauens; as wee haue formerly proued: but this diſparity growes not out of the diuerſity of Eaſt and Weſt, but the diſtance of North and South. But that places alike ſituate in Latitude, cannot vary by any diuerſity of the heauens is plaine: for as much as all things to them riſe and ſet alike, without any diuerſity: wherefore, if any ſuch diuerſity bee at any place found, we ought not to ſeeke the cauſe thereof in the heauens, but rather in the condition of the Earth it ſelfe, which no queſtion ſuffers in diuerſe places of the ſame Latitude a great variety.

8 Either Hemiſpheare may againe Reſpectiuely be ſubdiuided into the *Weſt* or *Eaſt*. The Weſt in this our Hemiſpheare I call that which is neerer the *Canary* Ilands; the *Eaſt* that which lieth towards the *Molucco Ilands*; to which points there are others correſpondent in the other Hemiſpheare.

1 *Places ſituate towards the* Eaſt *in the ſame Latitude, are hotter then thoſe which are placed towards the Weſt.*

For the explanation of this Theoreme, we are to examine two matters; Firſt, what probability may induce vs to beleeue the Eaſt to bee hotter temper then the Weſt. Secondly, what ſhould bee the cauſe of this diuerſity in both places, being ſuppoſed equally affected, in reſpect of the Heauens: for confirmation of the former, many reaſons haue beene alleaged of old and late writers. It is agreed on (ſaith *Bodin*) with a ioint conſent of the *Hebrewes*, *Greeks*, and *Latines*, that the Eaſt is better tempered then the Weſt: which hee labours to confirme; Firſt, out of many ſpeeches of *Ezekiel*, *Eſay*, and the other Prophets, where the Eaſt ſeemes to challenge a dignity and prerogatiue aboue the Weſt; which betokeneth (as he imagines) a bleſſing of the one aboue the other. But I dare not venter on this Interpretation without a farther warrant. Secondly wee may here produce the teſtimony of *Pliny* in his ſeuenth booke, where hee affirmes that by ordinary obſeruation, it is found that the peſtilence commonly is carried from the Eaſt into the Weſt, which *Bodin* teſtifies himſelfe to haue found by experience in *Galia Narbonenſis*, and many other hiſtory ſeemes to iuſtifie. *Amianus* a Greeke Author, obſerues that *Seleucia* being taken, and a certaine porch of the Temple being opened, wherein were ſhut certaine ſecret myſteries of the *Chaldeans*; that a ſuddaine contagion aroſe of incurable diſeaſes, which in the time of *Marcus* and *Verus* from the farthermoſt ends of *Perſia*, ſpread it ſelfe as farre as the *Rhene* and *France*, and filled all the way with heapes of carkaſſes. If at any time the contagion bee obſerued to bee carried another way, an vniuerſall peſtilence is feared: as according to the hiſtories there happened not long after from *Ethiopia* towards the North, which infeſted the greateſt part of the world. A third proofe may bee drawne from the teſtimony of *Ariſtotle*, *Hippocrates*, *Gallen*, *Cteſias*, and other graue Authors, who affirme that all things are bred better and fairer in *Aſia* then in *Europe*, which muſt needs argue a better temperature: To backe which Teſtimonies, we need goe no farther then moderne obſeruation. Euery Geographer will tell you how farre in fertility *Natolia* in *Aſia* ſurmounts *Spaine*; and *China*, vnder the ſame Latitude exceeds both: who knowes not how farre *Fez* and *Morocco* on the Weſterne Verge of *Africa*, ſtand inferiour to *Egypt*, a moſt fruitfull and happy Region? And how farre ſhort both theſe come of *India*, ſituate in the ſame Climate. An argument of greater heat in the Eaſterne places may bee the multitude of Gold and Siluer-mines, Spices, and other ſuch like commodities, wherein *Aſia* excells *Europe*: whereas ſuch mettals and commodities as require not ſo great a meaſure of heat in their concoction, are rather found in *Europe* then in *Aſia*: whence there ſeemes to ariſe a certaine correſpondency of the Eaſt with the South, and the Weſt with the North. The greateſt reaſon of all is taken from the Temper and naturall diſpoſition of the Inhabitants, for as much as the *European* reſembling the Northerne men, ſhewes all the Symptomes of inward heat ſtrengthned with externall cold. The *Aſiaticke* followes the diſpoſition of the Southerne man, whoſe inward heat is exhauſted by externall ſcorching of the Sunne-beames, and therefore partakes more of Choller-aduſt or *melancholy*. But this point wee ſhall more fully proſecute in due place. To ſhew a cauſe of this variety is very difficult. Thoſe which in wit and learning haue farre exceeded my poore ſcantling, haue herein rather confeſſed their owne ignorance, then aduentured their iudgement. It were enough to ſatisfie an ingenuous minde, to beleeue that Almighty God was pleaſed in the firſt creation of the world to endow the Eaſterne part of the Earth with a better temper of the Soyle, from whence all the reſt deriue their originall: which ſeemes not improbable, in that he made *Aſia* the firſt reſting place of man after the Creation, the ſecond Seminary of mankinde after the Deluge, the onely place of our *Sauiours Incarnation*. In this matter I beleeue no leſſe, and can ſpeake no more, except I ſhould vrge the beating of the great *Atlanticke* Ocean vpon our Weſterne ſhoares; which may in ſome ſort qualifie the exceſſe of heat incident to the Eaſterne tract, which may produce ſome degrees of Temperature. But here alſo wee ſhall perhaps meet with croſſe inſtances, which will ſtirre vp more doubt then ſatisfaction.

CHAP. IV.

Of the manner of Expreſſion and Deſcription of Regions.

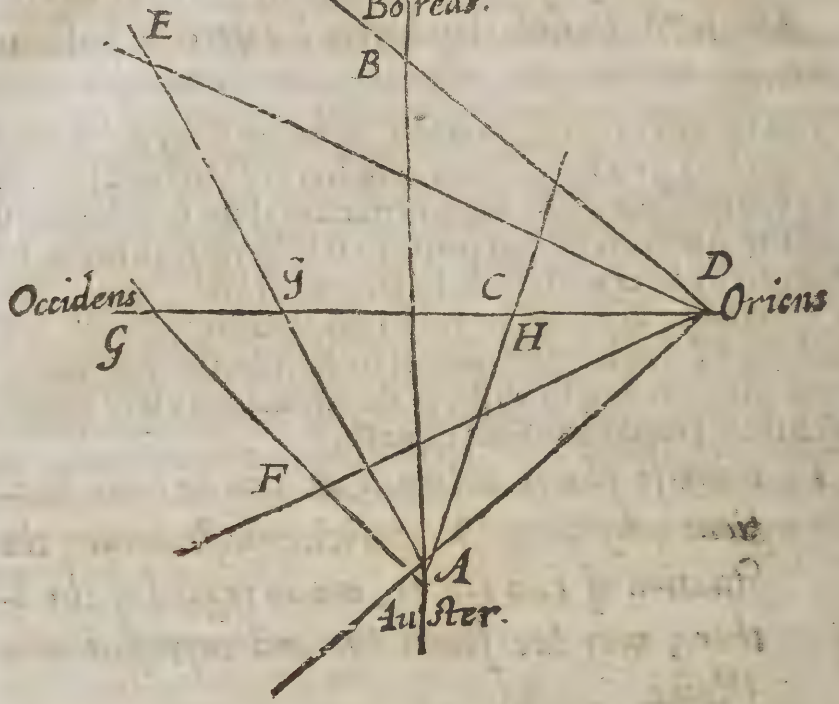
1 HAuing treated of the generall Adiuncts of places, wee are next to handle the manner of deſcribing a Region, which propoſeth vnto vs two points, 1 the finding out the *Poſition* of two places, one in regard of the other. 2 The *Tranſlation* of ſuch places ſo found out into the Globe or Charte.

2 The former depends on the inuention of the Angle of *Poſition* by ſome *Dioptricke* Inſtrument.

This manner of deſcription of a particular Region, ſeemes very neceſſary for a Geographer; which euery Mechanician may ſoone learne and practice. Many inſtruments haue beene deuiſed by curious Artificers for this purpoſe: whoſe vſe hath beene ſet out largely by later writers, as by *Gemma Friſius*, *Diggs*, *Hopton*, and others: to whom my reader may haue recourſe, becauſe I hold it not my taske in this ſubiect to deſcribe the *Inſtruments* themſelues; but briefly to ſhew the ground and vſe of them; which theſe propoſitions ſhall expreſſe.

1 *Diuerſe places obſerued at two or more Stations, by ſome* Dioptricke *Inſtrument, the ſituation of two places, one in regard of the other, may bee found out and expreſſed in a Plaine.*

This may ſenſibly bee ſhewed in the Figure following: to expreſſe which the more plainely, wee will ſet downe theſe Rules: 1 Let there bee drawne in ſome Chart or plaine platforme, a right line, which wee muſt accompt to bee our Meridian; becauſe it ſhall afterward ſerue for that purpoſe. This right line ſhall be A B, whoſe two ends A and B ſhall bee taken for the North and South. 2 You muſt chooſe out of ſome high place, as a *Towre* or *Mountaine*, from whence you may behold ſuch cities, townes, caſtles, and other ſuch notable places whereof you deſire to know the ſituation and bearing of the one to the other: This High place is called the *Firſt Station*; where you muſt place the plaine before prepared in ſuch ſort, as it may Aſtronomically and truely agree with the true Meridian of the place (whoſe inuention we haue taught in the firſt Booke) and ſo reſpect the foure Cardinall coaſts, to wit, *Eaſt*, *Weſt*, *North*, and *South*: Vpon this place ſeated in ſuch a man-

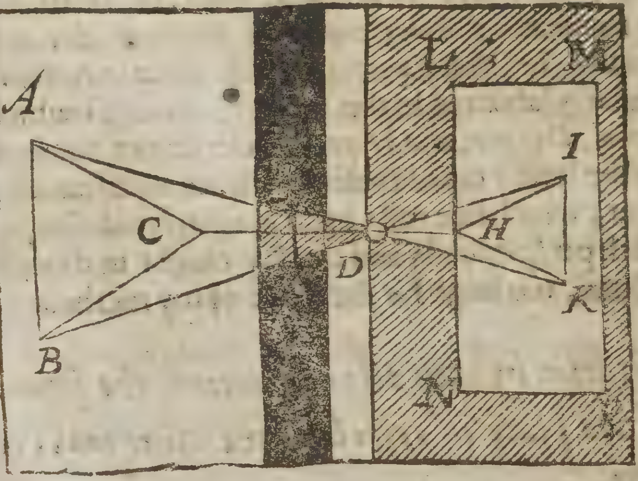


ner of ſituation faſten your *Dioptricke* inſtrument, that it may bee turned about the point A on euery ſide at pleaſure, in ſuch ſort, as the ſight may be directed to euery one of the adiacent places. Firſt then remouing it from A, direct your ſight to F, and draw the line A F of indefinite length: likewiſe your Inſtrument being directed to G, draw the line A G infinitely, which by this meanes will alſo hit the place E: Let B alſo bee imagined a certaine place, as a City, or Caſtle, ſituate in the very Meridian it ſelfe, which wee find already drawne to our hands. In like ſort ought wee to proceede with the other places C and D, and as many as we pleaſe.

This performed, you muſt remoue your ſelfe with your *Inſtrument* and *Plaine* to ſome one of theſe places thus fore-marked out; as for example vnto D, which is called the *ſecond ſtation,* and there as in the former, aſcending vp ſome high place, the Plaine being firſt fitted and placed *Aſtronomically*, take the diſtance AD of any length whatſoeuer; for to the greatneſſe of this Diſtance, ſhall all the reſt bee proportionall. Hence ſo place your *Dioptricke* Inſtrument at the place D, that it may bee turned round, and directed to all thoſe places formerly obſerued. In this ſort leuelling your ſight to the place or caſtle F, draw the line DF: ſo directing your ſight to the reſt, you may draw the lines DCG, DEDB; &c. Now by the points of Interſections of theſe lines, as in F, G, E, C, B, &c. are to bee deſcribed and delineated out the ſaid notable landmarkes, as *Townes*, *Caſtles*, *Promontories*, and ſuch like. Betwixt theſe places if any man deſire to know the diſtance in miles, hee may know it by finding out any one of theſe Diſtances; for one being knowne, the reſt will alſo bee exactly knowne: as for example, wee will imagine the Diſtance AD to containe 10 miles: wherefore let the line AD bee diuided into 10 equall parts: then with your compaſſe examine how many ſuch parts are contained in the Diſtance AF, for ſo many miles will bee likewiſe in it contained: as for example according to this ſuppoſition wee ſhall find it 5 parts: wherefore the caſtle or city F will be 5 miles diſtant from the city A. Hee that deſires more particularly to acquaint himſelfe with the vſe and diuerſe manners of deſcriptions of Regions, deriued from this one ground; Let him haue recourſe to diuerſe Authors who haue particularly laboured in this ſubiect; amongſt which our two *Engliſhmen*, *Digges*, and *Hopton*, deſerue not the leaſt praiſe: whereof the later, out of theſe principles hath framed a curious inſtrument, which hee calls his *Topographicall-Glaſſe*, whoſe vſe hee hath perſpicuouſly and exactly taught in diuerſe pleaſant concluſions, too large for the ſcope of my methode to inſert.

2. *At one Station by opticall obſeruation, the ſituation of one place in reſpect of the other may bee found out.*

This may bee ſhewed out of an opticall experiment, both pleaſant and admirable: The ground is expreſſed in this propoſition : *The light traiected by a narrow hole into a darke place, will repreſent in any Table or white paper within , whatſoeuer is without directly oppoſed vnto it* : For demonſtration of which propoſition, wee muſt take as granted of the *perſpectiue* Authours , That the viſuall Image or ſpecies will paſſe by a right line through any little hole , and will bee terminated in any point of the *Medium* : Now that it ſhould more perſpicuouſly bee ſeene in a darke place, then in the light. The cauſe is aſſigned to bee , becauſe the light of the *Sunne* is taken away , or much diminiſhed , which otherwiſe would hide and ſhadow the *ſpecies* of the thing which is preſented to the ſight ; as wee ſee by experience the greater light of the *Sun* to obſcure the *Starres* : which neuertheleſſe from the darke bottome of a deepe *Well* or *Mine*, will ſhew themſelues at mid-day. Neuertheleſſe wee muſt obſerue by the way , that this repreſentation of any thing to the ſight by this Image impreſſed in this ſort in a wall or paper , will ſhew it ſelfe ſo, as the parts will bee ſeene inuerſed , or (as wee may ſay) turned on the contrary ſide : as the *higher* , *lower* , the *lower*, *higher* ; the *right-ſide* , to the *left* ; and the *left* , to the *right* : which we may declare by an ocular demonſtration in this figure heere inſerted: Let vs imagine a Triangular platforme of land, whereof we deſire to know the ſituation , to bee A B C : from the extreame Angles of this Triangle, we will ſuppoſe certaine Rayes to bee drawne through the hole D into a darke place , wherein ſhall bee oppoſed to the hole D, a white Table or paper, which ſhall be N M : Here will



a Ray from the point deſigning out the Angle at A, bee carried through the hole, that it will point out in the Table K (becauſe all ſuch beames according to the *Opticks* are right lines.) Likewiſe the Angle B will in the Table deſigne out the Point I: alſo C will fall into the point H: Let K H, I K, H I, be ioyned together by right lines, there will appeare the Triangle I K H: wherein the top of the Triangle A will bee ſeene in the loweſt place K: Likewiſe the Angles of the *Baſis* B and C, will appeare in the points of the higheſt place H I: and the right ſide A C, will ſhew it ſelfe in the left H K: as the left ſide will be the right in I H: wherefore the ſide of the whole Triangle A B C will ſhew it ſelfe in the Table N M, although inuerſely placed according to the ſides and Angles: and of a various greatneſſe in reſpect of the diſtance of the Table from the hole. The inuention hath great vſe in *Aſtronomy*, in obſeruing *Eclipſes*, the beginning, and continuance, without any hurt at all to the ſight. No leſſe vſe may it challenge in *Topography* in deſcribing of *Territories*, *Citties*, *Borrowes*, *Caſtles*, and ſuch like, in their due ſymmetry and proportion: To practiſe which the better, *Renſner* would haue a little houſe built of light Timber, with a *Muliangle Baſis*: in euery one of whoſe ſides, a hole ſhould be made, looking inwardly, at the *vertex*, or top, but outwardly at the *Baſis*: through which the ſpecies or Image of all ſuch things as are viſible may haue free paſſage.

2 The manner of tranſlation of a Region into the chart, depends from the knowledge of the *Longitude* and *Latitude*.

3 The parts to bee deſcribed, whereof the chart conſiſts, are either *Eſſentiall*, or *Accidentall*: The Eſſentiall, are either the *Lines*, as are the *Meridians* and *Parallels*: or the *Places* to bee delineated out by Pictures;

The

The declination of both which, ſhall be taught in theſe rules.

1 *To ſet downe the* Meridians *and* Parallels *in a particular chart.*

To ſhew the practiſe hereof, wee will take for inſtance the Region of *France*, an example familiar with our later *Topographers*, and therefore can better warrant the deſcription: *France* is ſuppoſed to haue in latitude 10. degrees, in longitude 16: This knowne, you muſt proceede in this manner: Firſt through the middle of your table from head to foote, let there bee drawne a perpendicular line expreſſing the Meridian of the world, which ſhall bee marked with the letters E F: let this line bee diuided into 10. equall parts: then draw two *Parallell* lines, whereof the one muſt croſſe the ſaid line about the point E with right Angles: and the other *Parallell* muſt croſſe it againe beneath in the point F with like Angles: let the vppermoſt *Parallell* bee expreſſed by A B: The neathermoſt with C D: Then with your compaſſe take one of the 10 parts of the line E F, which is one degree, and ſet that downe apart by it ſelfe, diuiding the ſame into 60 Minutes, as the ſhort line G H, in the table here inſerted will ſhew on the right hand. Now you may learne by ſome Table or Mappe, that the fartheſt part of *France* toward the *North*, through which is drawne the *Parallell* A B is 52. degrees diſtant from the Equatour: And that the South *Parallell* CD, is diſtant 42 degrees: Alſo certaine Tables in our former booke will informe you, that to euery degree of the *Parallell* 42. delineated by A B, doe anſwer 37 miles: and that to euery degree of the *Parallell* C D, anſwer 45 miles: wherefore with your compaſſe take from the ſhort line G H, 37 partes or Minutes, and with your compaſſe kept at the ſame largeneſſe, let the *Parallell* A B bee diuided into 16 equall ſpaces correſpondent to that wideneſſe (that is to ſay) on each ſide of the Meridian 8 parts: at which Meridian E F, you muſt begine your meaſure towards either hand both right and left, marking the end of euery ſuch ſpace with a certaine point: Moreouer for the South *Parallell* C D. let 45 parts likewiſe bee taken from the ſhort line G H, and let that *Parallell* bee diuided into 16 ſpaces, correſpondent to that wideneſſe of the compaſſe, eight ſpaces being ſet downe on each ſide of the *Meridian* E F: So that wee muſt beginne from the *Meridian* E F, and marke the end of euery ſuch ſpace with a point. Then from thoſe points wherewith each of thoſe two *Parallells* A B, and C D is marked; Let there bee drawne a right line from point to point, and thoſe ſhall ſerue for *Meridians*, expreſſing as well the longitude of the whole Region, as of euery particular place therein ſeated. In like ſort as you haue diuided the *Meridian* E F, into 10 equall parts, ſo againe into the like number of equall parts muſt bee diuided each of the two vttermoſt *Meridians*, on the left hand and the right, marking with a point the end of euery ſuch ſpace, and ſo from point to point let there bee drawne right lines, cutting all the *Meridians*, and thoſe ſhall ſerue for *Parallells*, and in the vttermoſt ſpaces, let there bee written the numbers of *Longitude* and *Latitude*. The *Longitude*, is ſuppoſed to beginne at the vttermoſt *Meridian* at the left hand, which in both *Parallells* is the fartheſt *Meridian* Weſtward. Now for as much as the moſt Weſterly *Meridian* is foureteene degrees diſtant from the *Meridian* paſſing by the *Canary* Ilands, from which as the firſt *Meridian*, the auncients beganne their accompts: you muſt ſet downe in the firſt place on the left hand, as well ouer, as vnder in the firſt ſpace 15, in the ſecond 16, in the third, 17, and ſo orderly proceed through all the ſpaces, till you come to 30: For the difference betwixt 14 and 30, is 16: So you haue the whole *Longitude* of *France* expreſſed in your Table, which is 16 degrees: In the like ſort to expreſſe the *Latitude* (hauing the degrees of *Latitude* marked out) you muſt beginne at each end of the South *Parallell* C D, and ſo proceed vpward in the two vttermoſt *Meridians*, writing downe in the firſt ſpace at the foot of the Table 43 degrees, on the right hand and the left, in the ſecond ſpace 44, in the third 45, and ſo vpwards along to 52, ſo haue you expreſſed the whole *La-*

titude of *France* from North to South: for betwixt 42 and 52 are comprehended iuſt 10 degrees: Theſe degrees may againe be diuided at pleaſure into leſſer parts, as minutes, according to the largeneſſe of your chart.

2 *To ſet downe Citties, Caſtles, Mountaines, Riuers, and ſuch like ſpeciall places in the chart.*

The platforme of your chart being once drawne out, as wee haue formerly taught in the precedent rule, you may very eaſily ſet downe ſpeciall places by obſeruation of the Longitudes or Latitudes of ſuch places, either by inſtruments or Tables, and reducing them accordingly to your chart: which wee ſuppoſe before, marked out according to ſeuerall degrees: As for example, if wee would ſet downe in our chart the *Metropolis* of *France*, which is *Paris*: hauing recourſe to my Table, I finde it to haue in *Longitude* 23 degrees, in *Latitude* 48 degrees. Here to finde out the ſaid longitude you muſt extend a threed from the 23 degrees of the *Parallell* A B to the like degree in the *Parallell* C D: then holding it faſt, you muſt croſſe that threed with another extended from the *Meridian* A C, to the *Meridian* A D in the points of 28 degrees: The point wherin theſe two threeds ſhall cut and croſſe one the other, you may take for the true place of *Paris*, and marke it out in your chart: In like ſort you may proceede with all other places. But if you were to deſcribe a riuer in your chart, it will not bee ſufficient to take the *Longitude* and *Latitude* of the beginning or fountaine, but of the end, middle, turnings, and angles, Townes, or Cities, by which it paſſeth, Bridges and other occurrent circumſtances: In like ſort may you ſet downe *Woods*, *Forreſts*, *Mountaines*, *Lakes*, and other places whatſoeuer.

4 Thus much for the *Eſſentiall* part of the particular Chart: The *Accidentall* part wee call the *Scales of Miles*, which teacheth how

many miles are contained betwixt any two places in the Chart, wherein we are to know two things, 1 The *Fabricke*; 2 The *Vſe*.

1 *The Fabricke of the Scale depends from the certaine knowledge of the Diſtance of any two places in the Chart.*

The practiſe is very eaſie, and taught in theſe three Rules: 1 You muſt ſearch out the diſtance betwixt any two places whatſoeuer, which are contained in the Region, deſcribed in your Chart: which you may doe either experimentally by your owne knowledge, or ſome certaine relation of Trauailers. 2 Then muſt you draw three *Parallell* lines, containing two ſpaces, one larger, the other leſſer, in ſome voide ſpace of your Chart. 3 You muſt diuide the ſaid *Scale* into ſo many Miles, as the ſaid voide ſpace will giue you leaue, according to the known diſtance firſt found out: As for example, the diſtance betwixt *Paris* and *Roane* is knowne to be 30 *French leagues*, which containes 60 of our Miles, allowing for euery ſuch league, 2 Miles. Wherefore your *Parallell* lines being firſt drawne (as you ſee in the former Chart) diuide your Scale into 30 parts accordingly, and in the larger ſpace, place your Numbers, as 10. 20. 30. and ſo forth, ſo farre as your ſpace will conueniently extend.

2 *The Diſtance of any two places ſet downe in the Chart, being taken and applyed to the ſcale, will ſhew how many miles it containes.*

As for example, I would willingly know how many *Engliſh* Miles are contained betwixt *Paris* and *Orleans* in my Chart of *France*: Here I take with my compaſſe the diſtance betwixt the ſaid Cities in the Chart, and applying that to the Scale, I find it to containe 50 miles: which is the true meaſure.

CHAP. V.

Of Hydrography.

1 Hitherto haue we treated of the *Generall Adiuncts* and Proprieties of places in the Terreſtriall Spheare: we are in the next place to handle the *Diſtinction.*

2 A place is generally diſtinguiſhed into *Water* and *Land:* The Deſcription of the former is termed *Hydrographie*; The other for diſtinction we call *Pedography.*

3 Hydrographie is a Deſcription of the Water, with the Accidents thereunto belonging.

The Water wee conſider not here meerely *Phyſically*, as it is an Element, whereof mixt bodies are compounded; but *Topographically*, as it beares a part in the Terreſtriall Globe: yet are wee not ſo curious to exclude ſuch *Phyſicall* problemes and conſiderations as are moſt ſubiect to ſenſe; which a *Topographer* cannot well neglect: being the *markes* and characters, deſigning out ſpeciall places: To finde out the originall of the *Water*, wee muſt firſt take as granted, that Almighty God (as wee reade in the firſt of *Geneſis*) in the beginning made a ſeparation betwixt the waters *aboue* the Firmament, and the waters *vnder* the Firmament; whereof the former is termed in the Scriptures רקיע, which is as much to ſay as *expanſum*, a thing ſtretched out, or extended. By theſe waters *aboue* the Firmament, whether wee ought to vnderſtand the *cloudie va-*

pours in the middle Region of the Aire: or the *pure* fluid and liquid body, whereof the Firmament conſiſts; I leaue it to learned diuines and criticke expoſitours to diſpute: although the propriety of the phraſe (if it bee well rendred) will ſeeme to fauour this opinion rather then the other: for as much as the *Aire* can no way bee ſaid to bee aboue the Firmament, except the *Hebrew* terme miſcarry in the Tranſlation. For the ſolidity of the Celeſtiall Orbs, which *Ariſtotle* labours to confirme, is found long ſince to thwart the obſeruations of *Aſtronomers*: although it may thus bee retained as vſefull *ſuppoſitions* to ſettle Imagination. But to let this paſſe, and come to the waters vnder the Firmament, vnderſtood by the word מים, which ſignifies as much as a collection of waters: wee ſhall find them to haue taken their originall from the ſeparation of the waters ſubſtance from the Dry-land, cauſed by God in the firſt Creation, teſtified by *Moſes* in 1 *Gen:* which once granted (as no Chriſtian can deny) eaſily rebates the edge of the opinion of ſome auncient Philoſophers, who contended, out of the nature of *Drouth* and *Moiſture*, to deriue the beginning of this ſeparation. The dryneſſe of the Earth (ſay they) working by little and little, diminiſheth, or at leaſt reſiſteth the waters, ſo that they ſhould not altogether ouerwhelme the Land: But this reaſon is altogether deficient in Nature: Becauſe *Drouth* and *Moiſture* are no ſuch qualities to haue ſuch an operation: and if any ſuch there were betwixt *Drouth* and *Moiſture*, the *Drouth* (as wee ſee by experience) would rather draw moiſture vnto it, then any way expell it, or driue it away: whence it is moſt euident, that it was effected by no other meanes then the immediate worke and prouidence of God, for the preſeruation of liuing creatures: for, before God ſaid; *Let the waters bee gathered into one place*: the Water was ſaid to couer the whole-face of the Earth; but afterwards at Gods appointment, the water went backe, and ſhewed the dry-land. But by what meanes God ſeparated the one from the other, it is much controuerſed amongſt *Diuines* and *Philoſophers*. Many were of opinion, that the Earth was ſuffered to ſtand intire without alteration, and that the waters were eleuated aboue it; ſo that if they were ſuffered to flow abroad, they might againe couer the face of the Earth, as in the beginning.

But why the Waters ſhould bee thus reſtrained, is not agreed among them: for ſome thought, that this was done by the miraculous power of God, which reſtraines the flowing abroad of the Water, beyond ordinary bounds; of which opinion is St *Ierome*, who grounded his opinion (as it ſeemes) on the authority of the Scripture, eſpecially in the 8 of the *Prouerbs*, and the 103 *Pſalme*; where God is ſaid to haue ſet a *bound* vpon the ſeas, which they ſhould not paſſe: But this reaſon ſeemes not warrantable; That the great Creator of all things, ſhould in the firſt inſtitution of *Nature* impoſe a perpetuall violence vpon Nature. Moreouer all miracles are temporary, and not perpetuall; for then were it ordinary, and ſo ſcarce a miracle: others vpon leſſe ground, haue imagined that there are certaine *Northerne* ſtarres in *Vrſa maior* and *Draco*, of ſo great vertue, that they can draw the Ocean from this habitable part of the earth toward the *North*, and ſo conſtraine the waters, that they cannot ouerwhelme the earth: but this opinion is ridiculous, and deſerues no ſolide refutation: being a meere coniecture, without ground or probability: others vpon the like reaſon, haue dreamed that there is more *Water* then *Earth* in the Globe; and that the water by his extraordinary maſſe occupying the center of the world, turnes the earth on one ſide, making it to ſwimme as a ſhip vpon the ſea: But this aſſertion wee haue refuted in our firſt *Chapter* of the firſt booke: All theſe Authors ſuppoſe that the earth is vncouered toward the North-Pole; but ouerflowne with waters towards the South: which the experience of Nauigatours at this day hath ſufficiently diſanulled: Others againe affirming out of a *Peripateticall* dreame that the water is ten times greater then the earth, ſuppoſe the earth to bee like a ſponge to drinke vp the water: to proue which aſſertion they produce an experiment, that the earth being digged any thing deepe in moſt places, there will appeare water: whence they collect that the water is mixt with the whole earth, and receiued into it's concauities: But howſoeuer wee may graunt, that there are many and vaſt concauities in the Earth, capable of Waters; yet it is impoſſible, that the Water ſhould bee ten times as great as the Earth: for by this reaſon, although all the Terreſtriall Globe were Water, it could not bee, but that a greater portion of Water, then that in the Earth, ſhould ariſe aboue the Earth: becauſe, according to their owne *Suppoſition*, 9 partes ſhould bee aboue the Earth: Neither can *Ariſtotles* words bee well wreſted to this interpretation: For as much as hee vnderſtood this ten-fold proportion of the Water to the Earth; not of the *ſpaces*, which they repleniſhed, meaſured by their *Circles* and *Diameters*: but of the proportion they beare one to the other in their tranſmutation: as that one meaſure of Earth turned into Water, ſhould bee as much as 10. All theſe opinions ſeeming ſo abſurd, it ſeemeth more probable to imagine, that either the Waters are *condenſated*, and thickned, which were in the beginning created thinne: whence will follow, that they ſhould occupy a leſſe place, and by conſequence, leaue the dry-land in many places habitable: or, which is more probable; that God in the firſt Creation made certaine hollow concauities and channels in the Earth, which was before plaine and vniforme; into which the waters were receiued and bounded, in ſo much, that they could not flow abroad. This ſeemes enough to ſatisfy the ſearch of ſuch as are not too curious to ſearch into his ſecrets, whoſe power and omnipotence tranſcends the capacity of the wiſeſt: In this diuiſion of a place into *Water*, and *Land*, wee will firſt treat of the Sea, and the accidents belonging thereunto: Not that the water is worthier or greater then the Earth; The contrary whereof wee haue proued heretofore: but becauſe the conſideration of it, is more ſimple, as that wherein fewer matters are to bee handled then in the land. For Riuers and Lakes, although conſiſting of this watery element, wee thought fit to handle apart: as adiuncts belonging to the land.

4 In the Sea are conſidered two things: 1 The

Adiuncts, 2 The *Diuiſion.* The Accidents of the ſea whereof we are to treat, are either *Internall*, or *Externall.*

5 The *Internall*, are ſuch as are *inbred* in the *Sea:* Theſe againe are either *Abſolute* or *Relatiue.*

6 The Abſolute, are ſuch as agree to the Sea, without any compariſon with the land: ſuch are either, *Figure*, *Quality*, or *Motion.*

7 The figure is the conformity of the externall ſuperficies of the Sea; whereof obſerue this Theoreme.

1 *Although the whole body of the water be* Sphericall, *yet it is probable that the parts of it, incline to a* Conicall figure.

That the whole Water according to it's outward *ſuperficies*, is *Sphericall* and *round*, is ſufficiently demonſtrated before, in the firſt booke. But notwithſtanding this roundneſſe of the whole, the parts of it may (for ought I ſee) admit of a *Conicall* figure; for as much as this hath little or no proportion to the vaſt *Spheracity* of the *Water*, no more then little hils, to the greatneſſe of the Earth. For the proſecution of which point, I will firſt ſhew the reaſon of this my coniecture, grounded on experience; and afterwards out of the ground and demonſtration of the principles of *Mathematicall Philoſophie*, endeauour to make it more manifeſt. Firſt therefore by a *Conicall* line, wee vnderſtand a crooked line which differs from a *Periphery* or circle, in as much as it keeps not alwayes an equall diſtance, from the center: but is higher in the midſt, then on either ſide: Now if the parts of the water ſtanding ſtill, were in their higher ſuperficies exactly ſphericall; they ſhould by the ſame grounds bee *concentricall*, or haue the ſame center with the whole Earth: But that it hath not the ſame center, will appeare by little *dropps* of Water falling on the ground, which incline (as wee ſee) to a round figure; yet were it more then ridiculous to ſay, that this round conuexity of a droppe could bee *concentricall* with the whole Earth: ſith in ſo great a maſſe, it is hardly ſenſible. But here our ordinary Philoſophers are ready to anſwer, that this conformity of the water dropps in a round figure, is rather *Violent*, then *Naturall*: becauſe the Water being by nature moiſt, is ready to fly, and auoid the touch or drouth, or any dry thing. And becauſe the Water thus auoiding the drouth, cannot of neceſſity but ſome way touch it, it is imagined to conforme it ſelfe to that figure, whereit it may leaſt of all touch: This is the round or *Sphericall* figure; wherein any body contained, cannot touch a *plaine*, otherwiſe then in one onely point. But againſt this coniecture of *moiſture* flying *drouth*, ſtrong enough is the experiment of *Scaliger*, in his 105 *exercitation*: that *quick-ſiluer* a moiſt ſubſtance, being caſt either into *Water* or *Iron-Oare*, will gather it ſelfe to a round body, notwithſtanding it is manifeſt, that *quick-ſiluer* naturally neither auoides the touch of Water, or Iron, for as much as the one is very *moiſt*, the other of great affinity, (as our Chimicks teach) with *quick-ſiluer*, the parent of all Mettals. Moreouer it is manifeſt, that this conformity to roundneſſe, is in dropps of raine falling to the Earth, through the *Aire*: yet will not our *Peripateticks* admit of any drouth in the Aire, which this moiſt element ſhould ſeeke to auoid. Moreouer if Water ſhould conforme it ſelfe to roundneſſe, by reaſon of the drouth of the body, whereon it fall, then muſt it follow; that either the moiſture of the *Water* ſhould expell the drouth of the *Earth*; or elſe that the drouth of the *Earth* ſhould worke on the moiſture of the *Water*; But neither can be graunted with probability. Firſt becauſe moiſture and drouth are not qualities of ſuch actiuity to driue and remoue, one the other from one place to another, as it is here imagined: Secondly; if the moiſt ſhould worke on the dry, it ſhould either touch it or not : If it touches not, it cannot worke on it : becauſe no *Phyſicall* action can bee performed without touching : beſides, it were very impoſſible, to imagine that without this touch, one of theſe qualities ſhould perceiue or ſent the other to auoid it. If it touch, it auoides not the touch, but ioynes it ſelfe with the drouth : And indeed reaſon and experience ſhewes, that drouth rather couets and drawes vnto it ſelfe moiſture, then expels it : wherefore *Scaliger* goes about to forge a new cauſe of this experience. Euery thing (ſaith hee) in this nature is one, and the ſelfe-ſame : But this vnity in Homogeneall bodies, is beſt preſerued in a *Globe* or *round* figure : wherein is no inequality, no parts higher or lower, abounding or deficient. But here might a man aske why the greater parts of the Water are not likewiſe conformed vnto roundneſſe, as well as the leſſer droppe ; Hee would perhaps anſwer, that nature in them was not in ſuch diſtreſſe, to make vſe of this ſpeciall priuiledge ; I grant it : yet find I in this no ſatisfaction ; for as much as hee giues a finall cauſe, where I ſought an efficient : for I would farther aske by what action or motion this water ſhould gather it ſelfe into a circular figure, and from what forme it ſhould ariſe : for firſt wee haue ſhewed, that this motion cannot proceed from the externall drouth, wee muſt ſeeke the cauſe in the water it ſelfe : here wee ſhall finde it, either the *particular* forme of the water, or a certaine *vniuerſall* forme, as ſome ſuppoſe it cannot bee imagined, that it ſhould proceed from the generall forme of the vniuerſe : Firſt, becauſe as wee haue elſewhere proued, there is no ſuch Internall forme of the world : Secondly, thoſe motions are commonly aſcribed to an *vniuerſall* Nature or forme, wherein any particular body (as it were) neglects his owne Nature, for the preſeruation of the whole Vniuerſe. But here water containing it ſelfe in an orbe, and not flowing abroad towards the Center, rather ſeemes to forſake the Center and Vniuerſe to preſerue it ſelfe. Whence we muſt neceſſarily conclude, that this roundneſſe in drops of water caſt on the ſand, proceedes not from externall drouth, nor any vniuerſall forme, but from the ſpeciall and eſſentiall forme of the water ; and conſequently , becauſe it makes a circle *excentricall* with the Earth , it muſt bee found riſing higher in the midſt : To which wee will adde another experiment: Let there bee caſt on a large Table or planke , a little portion or drop of water : I here aske, whither this water on the midſt of the Table equilibrated , will continually flow abroad , or at length ſuffer a ſtay or ſtop ? It cannot bee continually ſpread abroad : firſt, becauſe experience teacheth the contrary ; for we ſee little drops caſt on ſuch a plaine , to confine themſelues within certaine bounds : and leaſt any ſhould imagine (as before) that this happens by reaſon of the drouth of the Table , let him firſt moiſten the Table , and hee ſhall find no great alteration : Secondly , if the water ſhould alwayes fall downward, and ſo ſtill runne abroad , and ſpread it ſelfe to the margents of the Table , it would follow, that if the Table were of an infinite capacity , the water thus ſhed , would infinitely flow abroad , without intermiſſion ; and ſo ſhould Nature ſet no bound to the thickneſſe and motion of the water: whereof experience hath ſufficiently taught the contrary. Now , that water thus ſtanding ſtill on a plaine equilibrated Table , ſhould haue a *Canonicall* figure , it may bee plainely proued almoſt by ſenſe , whereby wee perceiue the middle to bee higher then the extreames : for no man can deny but the water thus ſtanding , is endowed with thickneſſe , for as much as it is a naturall body. Wherefore of neceſſity it muſt ſwell aboue the Table. It cannot bee *Spherically Concentricall* with the whole Earth , becauſe in ſo ſmall a ſegment of an Arch , as this little quantity of water admits , it would bee inſenſible. It cannot bee plaine , becauſe the ſides or extremities of it touch the Table , whereas the middle *ſuperficies* , by reaſon of the thickneſſe , is eleuated aboue the Table. Neither can wee imagine another figure beſides , which can aptly bee admitted. It is meet in the next place, that out of the grounds of Philoſophie , wee explaine how it comes to participate this figure : where wee are firſt to vnderſtand , that the figure of the water is (as it were) compounded of two ſpheares ; whereof the firſt is imagined to bee *concentricall* with the whole Earth ; the other leſſer onely anſwering to the portion or quantity of water, were it made round; for if wee conſider the ſimple and particular nature of the water, wee ſhall find it inclining to roundneſſe of it ſelfe, as wee haue ſhewed by experiment; yet ſuch a ſenſible roundneſſe, as cannot haue one *Center* with the Earth. But if we conſider the water as it concurres to the conſtitution of the whole Vniuerſe, wee ſhall find this Figure to partake of a *circular* ſegment *concentricke* with the whole Earth. Now becauſe neither of theſe two Figures can preciſely and exactly ariſe by it ſelfe, ſith the one muſt needs ſomewhat alter the other, wee muſt of neceſſity admit of a figure mixt and compounded of both theſe; which can bee no other then a *Cone*. To expreſſe this more plainely (becauſe this path is yet vntroden) wee find in the water a double motion directed to this double figuration. The firſt whereof is that, whereby all the parts of a quantity of water, are inclined to an Abſolute roundneſſe, or Sphericall Figure, without reſpect of the Vniuerſe: the Center of which roundneſſe, is to bee ſought in the water it ſelfe. The later is that, whereby the parts of the Water conforming themſelues to the Center of the Earth, as neere as they can, make a *Sphericall* figure (as much as Nature can ſuffer) *concentricke* with the whole Terreſtriall Globe. In the former of theſe motions, the Water ſeekes it's owne preſeruation; in the later, the ſafety of the whole Vniuerſe: for the ſafety and conſiſtency of the whole, is deriued from the part, which concurre to preſerue the whole. To expreſſe a little better the manner of theſe two concurrent operations; wee will take for an vndoubted ground; *That God hath giuen to Nature a power and inclination to preſerue herſelfe.* This granted, wee muſt diſtinguiſh of a two-fold preſeruation: the one *Speciall*, wherein euery Body ſeekes it's owne ſafety: the other *Generall*, wherein all Bodies concurre to the preſeruation of the whole: The former proceeds from the ſpeciall Forme and Nature of euery Body; which is performed by the vnion of all his parts to it ſelfe; this vnion is greateſt of all in a Sphericall figure; wherein all the extreme parts are equally diſtant from the Center, admitting no Equality of dimenſion. The Generall depends from the Reſultancy and

Harmony of all the parts, whereby is cauſed an vnion of all the parts with the whole; to whoſe preſeruation they are ſecondarily directed: whence ariſeth a double figurature of the water; the one of a Spheare, excentricall with the Earth: the other alſo of a Spheare, but concentricke with the Earth; whereof this Conicall figure is compounded. Why this figure ſhould be more ſenſible in a ſmall drop or quantity, then in the Ocean, may bee declared from the ſame ground well vnderſtood; becauſe the conuexity of the leſſer Spheare excentricke with the Earth, is more; and the greater, is leſſe: for by how much the leſſer is the Spheare, the greater will be the conuexity: and by how much greater the Spheare, the leſſer will the bee conuexity, or crookedneſſe. Wherefore this crookedneſſe being in a ſmall meaſure of water very ſenſible, in a maine Ocean will by ſenſe be hardly diſtinguiſhed from a right line.

8 Of the Figure of the Water wee haue ſpoken: Wee muſt now ſpeake of the Quality, which is two-fold: Saltneſſe, and Thickneſſe.

1 *The Water of the Sea is ſalt, not by Nature, but by Accident.*

That the Sea is of a ſaltiſh Quality, no man hath euer doubted, at leaſt in moſt parts: But whether this ſaltiſh Quality, eſſentially agrees to the center of the Sea, as therein created, or elſe Accidentally brought in, I finde no ſmall difference among Philoſophers. Thoſe which defend the ſaltiſhneſſe to bee Accidentall, are diuided into diuers ſorts: for ſome of the old Philoſophers imagined, that the Earth chafed and Heat with the Sunne, continually ſweats out water: whence is made the Sea, and therefore ſhould haue a ſaltiſh taſte, becauſe all ſweat is of this Quality: But this opinion I take to bee no other then a pleaſant Allegory of the old *Greeke* writers, who wrote their Philoſophy in verſe, and therefore vſed ſuch alluſions, as wee ſhall perhaps find in many other matters, poëtically deuiſed of them ; yet refuted of *Ariſtotle* in good earneſt : others haue more probably coniectur'd, that this ſaltiſhneſſe was firſt deriued from the Earth, through whoſe parts the Water being ſtrained, is apt to receiue this Quality, being primarily in the Earth it ſelfe : as wee ſee water being wrung through aſhes, to grow ſalt : but this opinion ſeemeth of no great ſoundneſſe ; becauſe the firſt Riuers and Lakes being drawne out of the Earth altogether, and in regard of their ſmall quantity, more apt to yeeld and receiue this tincture, are notwithſtanding deuoide of all ſuch Quality. Beſides this, wee rather find the contrary by experiment : That Sea-Water ſtrained through clay, will turne freſh : as likewiſe powdred fleſh being layed to ſoake in ſalt water, will ſoone turne ſweet : The former is verified by *Baptiſta Porta* : of the other, euery kitchin-maide on the Sea-ſide will informe vs. The third opinion is of *Ariſtotle*, who referres the ſaltiſh quality of the Sea-water to the *Sunne*, as the chiefe cauſe, drawing and lifting vp out of the Sea ſtore of exhalations, which afterwards mixt with vapours, fall downe againe by drops : for the Sunne drawes vp the thinner and freſher parts of the water, leauing the thicker and lower water to ſuffer aduſtion of the Sunne-beames, and ſo conſequently to become ſalt : ſo that the matter of this ſaltiſhneſſe in the Sea, is by an exhalation : the Sunne drawing vp to the middle Region of the Aire, the freſher parts ; where thickned, they deſcend in raine, leauing the reſidue of the Sea ſalt. The forme is the ſtraining and concoction, which is made by the Sun ; for the ſaltiſhnes is ſaid to ariſe out of the commixtion of Terreſtriall dryneſſe, concurring with moiſture, ioin'd with aduſtion of Heat : ſo that two things are chiefly concurring to the Generation of ſaltiſhneſſe ; to wit, Drouth and Aduſtion. This ſeemes to bee prooued by inſtance of Freſh-waters in the kitchin, which turne ſalt, being much boyled, becauſe the thinner and ſweeter vapours of it are drawne vp, and diſſipated, leauing that behind which is thicker and ſaltiſh. The ſame would ſome haue in the Sea, ſeethed (as it were) and burnt with the Heate, which we experimentally find in hot water on the fire. But this is excepted againſt by ſome, becauſe wee find by experience, that many ſalt wells and fountaines ariſe in diuers places of the Earth, which are ingendred in the bowels of the Earth farre remote and ſeparate from this extreame heate and aduſtion of the Sunne-beames: But to this wee may eaſily anſwer, that ſuch ſalt-ſprings are either by ſome violence enforced from the ſea by certaine ſecret cauernes, and hollow places of the Earth: or elſe that they receiue their tincture of ſaltneſſe from ſome ſalt minerals of the Earth, through which they paſſe. Wherefore this opinion of *Ariſtotle* I ſee not yet ſufficiently refuted. The other opinion concerning this quality of ſuch, which would haue it eſſentiall to the ſea water, and inbred in the firſt creation, is grounded on two finall cauſes: Firſt they ſay that the ſea is ſalt, for the preſeruation of the Fiſhes, who would otherwiſe rot, becauſe experience ſhewes, that Fiſh will ſoone putrifie without ſalt; but this is thwarted by three reaſons: Firſt, becauſe if fiſh were in this ſort ſalted in the ſea Water, the cooke might ſaue himſelfe a labour in ſalting them againe in his kitchin: Alſo Fiſhes caught in the ſea, are oftentimes preſerued longer and ſweeter, leſſe needing ſalt then thoſe which are found in freſh Ponds and Riuers: Secondly, if this reaſon ſhould hold currant, why ſhould not the Fiſhes alſo rot and putrify in freſh Water? Thirdly, why ſhould fiſhes couet the freſh Water (as wee ſee by experience in many fiſhes) if in it they ſhould ſuffer putrefaction, which is a great enemy to nature; Aboue all what need wee feare this putrefaction of fiſhes, while they are endowed with a liuing ſoule, which is a greater preſeruatiue then all the ſalt in the world; or why ſhould wee not doubt the ſame calamity in all liuing creatures in the land, which are as ſubiect to rotteneſſe in the Aire, as the other on the land? The ſecond cauſe (ſay they) Why the ſea ſhould bee created ſalt, is; Becauſe the ſea it ſelfe ſhould not putrify, for as much as wee find by experience, that ſalt is the only thing to reſiſt Putrefaction; But here wee may demaund; why theſe Authors ſhould feare Putrefaction in the vaſt body of the ſea, rather then in other Waters and Riuers, which are neither ſalt, nor come neere the greatneſſe of the Ocean;

whereas *Ariſtotle* affirmes in the fift chapter of the 4 booke of his Meteors, that if the Sea were diuided into many parts, it would more eaſily diſſolue and putrify. The grounds of this opinion being ouerthrowne, there want not reaſons to contradict: Firſt (ſayes one) if the Sea were not created ſalt, then was there ſome time wherein it was freſh: To this I anſwer two wayes: Firſt, that it might bee created freſh, yet being apt from the heat of the Sunne to receiue ſaltneſſe, it might, almoſt at the firſt receiue it. Secondly, if I ſhould grant that it was a long time before it embraced this quality, I know neither Hiſtory to confute mee, or reaſon to conuince mee. Secondly, it is vrged from the Nature of liuing creatures in the Sea, that they cannot well liue in freſh waters, and therefore it ſeemes originally ſalt, and not by Accident: But this is of no great force: Firſt, becauſe experience ſhewes, that many kind of fiſhes liue in both, and many rather couet and deſire the freſh Water, then the Sea: Secondly, it is not improbable, that as the Sea by little and little and by degrees turned from freſhneſſe to ſaltneſſe, the temper and diſpoſition of the fiſhes, was in like manner changed and altered: Whence it may come to paſſe, that fiſhes ſince bred and nouriſhed in freſh Waters, cannot ſo well endure the ſalt. Moreouer who knowes whether all theſe ſeuerall kinds of fiſhes now found in the Sea, were from the beginning, ſince wee ſee by experience, that ſundry kinds of liuing creatures dayly ariſe out of putrefaction on the land, which may with like probability, or more, bee admitted in the Sea. There are yet behind other reaſons of one *Patricius* a *Platoniſt*, who would oppoſe *Ariſtotle* in good earneſt. *Ariſtotle* (ſaith hee) ſpeaking of the ſaltneſſe of the Sea Water, ſhewed not the cauſe. For I would aske, why that parcell of water, from whence the thinner parts are extracted, ſhould remaine ſalt: was it ſo from the beginning, or afterwards impreſt; was it *Inbred*, or *Accidentall*? If hee would haue it an inbred quality from the beginning, hee vainly goes about to ſeeke out the cauſe; If the *ſaltneſſe* bee *aduentitious*, the cauſe is to bee giuen; but the cauſe giuen by him, is not true, for as much as it rather takes away the ſaltneſſe: But to theſe obiections of *Patricius*, ſpunne out in many words, wee may anſwer two wayes: either that the ſaltneſſe is meerely aduentitious bred by an exhalation, drawne vp by the Sunne, and ſo diſtilling downe againe; or elſe, becauſe this anſwere ſeemes not wholely to ſatisfy. For as much as rainy Water is ſeldome ſalt, and if it were, could hardly flow in ſo great quantity to feed the ſaltneſſe of the Sea: I will anſwer ſecondly, that the ſaltneſſe is radically or originally in the matter of the Water; yet ſo, as it cannot bee drawne out and ſenſibly bee perceiued in the mixture of many ſweet humours, ioyned with it, without a ſeparation firſt made by the heat of the Sunne of the thinner parts from the thicker: So that the Sunne is a diſponent, though not a productiue cauſe of this ſaltneſſe in the Sea.

2 *Seas abſolutely ſalt, are neuer frozen.*

This may ſeeme a *Paradoxe* to ſome men, in regard that amongſt our *Geographers*, wee haue ſo often mention made of *Mare Congelatum*, taking it's name from the Ice wherewith it is ſhut vp from paſſage: as alſo for that in the voyages of *Frobiſher*, *Dauis*, *Hudſon*, and other later Nauigatours, which haue beene imployed in the ſearch of the *Northweſt* paſſage, wee find ſuch ſtrange relations, not onely of Seas cloſed vp with Ice, and hindring their paſſage towards the North; but alſo of *Rocks* and *Ilands* of Ice, of an incredible greatneſſe. The truth of theſe Relations I no way diſapproue, but rather out of theſe teſtimonies, approue our former aſſertion; that Seas which are wholly *Salt*, are neuer found to freeze: For firſt whereas it is called *Mare Congelatum*, it may beare the name well enough from the multitude of Ice floating on the water, or collected into a Rocke or Iland. This Ice (as it will eaſily appeare) is not produced out of the ſubſtance of the Salt water of the maine Ocean, but rather carryed into the Sea by great riuers of freſh water running into the Ocean: For the riuers are not alwayes frozen; but ſometimes by a remiſſion of the cold are thawed, and the peeces broken a ſunder, and floating into the Sea, in it oft times meet in great heapes, which may bee proued: 1 In that theſe great rocks of Ice melting with the heate of the Sunne, haue diſſolued into fountaines of freſh water, guſhing downe in great abundance, wherewith ſometimes in caſe of neceſſity, they haue fraughted their ſhippes, as wee haue teſtified by the fore-named Nauigatours. 2 Becauſe ſome part of the maine Sea, ſituate perhaps more Northerne, and in a colder Climate, ſuffers not this accident: whereas places neere the ſhore, farther South, are almoſt alwayes frozen: The reaſon whereof, is; becauſe the Sea neere the ſhore is commonly mixed with freſh waters, conueyed in, either by great Riuers, or infinite ſecret paſſages vnder ground, which wee ſee not: The reaſon why that ſalt waters exclude this propriety incident or the freſh, I take to bee the *Hot-ſpirits*, hid in the ſalt humor, which are more feruent and operatiue, then thoſe of the freſh water.

9 So much for the *ſaltneſſe*: The next, is the *Thickneſſe*: whereof we will ſet downe this ſhort Theoreme.

1 *The Water of the Sea is thicker then other Water.*

This Propoſition hath it's light from the former: becauſe thickneſſe of Water is a companion of the ſaltneſſe, as depending from the ſame cauſe, to wit, the exhalation, and extraction of the thinner parts of the Water. There are many finall cauſes giuen by *Patricius* of this thickneſſe of the Sea-Water. Firſt, becauſe the parts of it ſhould more ſtrongly hold together, and not couer and ouerflow the firme land: But this ſeemes to bee grounded on an errour, that the Water ſhould be aboue the Land; and that it ſhould containe it ſelfe within it's owne bounds and limits, which opinion we haue elſewhere reiected. The ſecond cauſe of the thickneſſe of the Sea, is; that it might bee more apt to beare and carry ſhips, and other great weights for the vſe of man. Thirdly, the Water being thicke, may more eaſily bee conuerted into *ſalt*, out of which, many ſaltiſh minerals in the Earth are ingendred. Other cauſes are giuen by this Author, but leſſe forceable, which we will omit, as referring them to the Philoſopher, whoſe proper taske it is to ſeek them out.

CHAP. VI.

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Of the Motions of the Sea.

1 THe Motion of the Sea, whereof we are in this Chapter to treate, is either *Naturall*, or *Violent*. The Naturall I call that, which is partly incident to the Naturall Diſpoſition of the Sea.

2 This againe is two-fold, either *Generall*, or *Speciall*: Generall is that which agrees generally to all, or at leaſt to moſt parts of the Sea: ſuch as is the *Ebbing* and *Flowing* of the Sea.

Wee muſt here obſerue, that the Water hath a two-fold Motion; The firſt is common to all heauy Bodyes, as well as the Earth, in which is an inclination to come as neere as they can to the Center of the Earth, whereof wee haue ſpoken in our former booke: The ſecond is that which more properly agrees to the Sea, which is againe twofold: either the *Naturall*, or the *Violent*. The Naturall, howſoeuer requiring perhaps the concurrence of ſome externall cauſe, is notwithſtanding ſo called; for as much as it chiefly ſeemes to proceede from the Diſpoſition of the Sea-water; The Violent is cauſed meerely by the violence of the winds mouing the Ocean. The

Naturall motion we haue againe diuided into generall, or ſpeciall; becauſe the *Affluxe*, and *Refluxe* of the Sea, whereof we are to treat, is generall throughout the whole Ocean, (ſome petty creekes perchance excepted) whereas the Currents, (which is the ſecond kinde of motion) are more ſpeciall, as agreeing not to all, or moſt parts (as it ſeemes) but to ſome one or other ſpeciall place, as we ſhall ſhew.

1 *The Sea twice euery day ebbes and flowes.*

The flowing and ebbing of the Sea, howſoeuer it cannot be preciſely obſerued in all Seas; yet becauſe few places of the maine Ocean are exempted from it, deſerues the firſt & chiefeſt conſideration. That ſuch a motion there is, experience ſhewes; but the ſearching out of the cauſe, is, for ought I can obſerue, one of the greateſt difficulties in all *Naturall Philoſophie*: in ſo much as *Ariſtotle* one of the acuteſt Philoſophers, is reported to haue ſtood amazed at the flowing and ebbing of *Euripus*, and deſpairing of finding out the cauſe, at length enforced to caſt himſelfe into the Riuer which had before confounded him. Wherefore it may ſeeme ſufficient for mee to trace their ſteps, who haue waded far into the ſearch of this cauſe, hauing very little hope to goe further. The firſt opinion was of the *Stoickes*, who ſuppoſed the whole World to bee a great liuing creature, compoſed of diuerſe Elements, which inioyes both breath and life: This liuing creature they imagine to haue his noſtrils placed in the maine Ocean, where by drawing in, and ſending foorth breath, the *ebbing* and *flowing* of the Sea is cauſed: but this ſeemeth rather to bee a *Poeticall* fiction, or *Allegory* then any conceit of a Philoſopher. *Apollonius Tianæus* was of an opinion, that certaine Spirits either vnder, or aboue the Water, breathed into it this motion. *Timæus* taught the cauſe of this moiſture to be the riuer, breaking into the Ocean by the great mountaines; *Plato* thought that it was made by the ſwallowing vp of the Sea into a gulfe or hole which being againe caſt out, was the cauſe of that motion in the Sea. *Seleucus* the Mathematician, which affirmed that the Earth was carried round with a perpetuall motion, thought that the Moone was turned round with a motion contrary to the motion of the Earth, and from this to proceed that motion of ebbing and flowing of the *S*ea, whereof wee now treat. What *Ariſtotles* opinion was concerning this matter, is an vncertaine coniecture; foraſmuch as litle or nothing can bee gathered touching this point in controuerſie out of any booke, which is certainly knowne to be *Ariſtotles*: for the tract of the propriety of Elements, where the cauſe of this motion is aſcribed to the *Moone*, is iudged to be none of *Ariſtotles*, but of ſome later Authour. Yet *Plutarch* impoſeth on *Ariſtotle* this opinion; that this motion of the Sea ſhould come from the Sun, becauſe by it are raiſed vp many windy exhalations, which ſhould cauſe the *S*ea to ſwell, blowing into the great Atlantick Ocean. But this opinion is charged by *Patricius* of a threefold errour: 1. That it ſhould proceed from the *Sun*; 2. From the wind; 3 That it is only in the *Atlantick Sea*. He ſaw (ſaith *Patricius*) that in the *Atlantick*, which he could not in the *Ægean* Sea at home and neere *Athens*. For 1 No wind blowes ſo regularly, that for one ſix houres it ſhould blow forward, the other ſix houres backward: for the wind oftentimes blowes many daies the ſame way without ceaſing; yet is their not one only flowing or one ebbing in the Sea. 2. The *Sunne* ſtirres vp ſometimes windes, and ſometimes ſtirres them not vp. But of a *perpetuall* effect which is daily, why would this Philoſopher giue a cauſe meerely *violent*, and not *quotidian*, which notwithſtanding would haue nothing violent to be perpetuall? If the Sea bee ſomewhere moued naturally by other motions, as the *Euripus*, (which is ſaid to be his death) wherefore will he deny this motion to be *Naturall*, ſeeking out an externall cauſe of this effect? But all this while our *Platonick Philoſopher* ſeems to fight with ſhadowes: for what iudicious man can imagine ſo iudicious and wiſe a Philoſopher as *Ariſtotle*, ſhould ſo groſſely ouerſhoot himſele to father this opinion? I ſhould much rather beleiue that no ſuch opinion is to be found in *Ariſtotle*, at leaſt that it is indirectly related: which I the rather beleiue, becauſe one *Cæſalpinus* a late Writer, aſwell oppoſite to *Ariſtotle*, as the

other,

other hath related *Ariſtotles* opinion otherwiſe; to wit, that the ebbing and flowing of the Sea is deriued from a double cauſe: whereof the one is the multitude of Riuers bringing in a great force of waters into it: whence it comes to paſſe that it flowes only towards one part, which is the lower, as it happens to the *Mediterranean*; For the *Egæan* and *Ponticke* Sea, with *Mæotis*, flow into the *Tyrrhene*, and not on the oppoſite ſide: The other cauſe hee makes to bee the *libration* of the whole Sea: for it is often turn'd from one ſide to the other, which in ſo great a vaſtnes ſeemes but little; but in ſtraights & narrow places much more. So that *Ariſtotle* (ſaith *Cæſalpinus*) would haue that to agree to the Sea, which vſually happens to a paire of ballance: which hauing receiued the beginning once of their motion, are inclined ſometimes this way, & ſometimes that way, by reaſon of the equality of the weight: for if the weight of one ſhould ouercome, the whole would incline that way, and would not riſe vpon the other ſide. But againſt this opinion impoſed on *Ariſtotle*, *Cæſalpinus* not without good reaſon, excepts, that the *Superficies* of the Water being *Equidiſtant* from the Center (as is ſuppoſed by *Geographers*) no reaſon may bee giuen why it ſhould incline more to one ſide then another, hauing once obtained his true place: ſith according to *Ariſtotles* owne grounds, no violence can be perpetuall. To which I may adde another anſwer, that no ſatisfactory reaſon can be alleadged, why it ſhould alwayes obſerue ſo true and iuſt periods of time in its motion: ſith all Riuers are ſometimes encreaſed, and other times diminiſhed according to the ſeaſon of the yeere, and variety of the weather: wherefore the ſaid Authour, which impugnes this opinion, hath framed another conceit, grounded on the circular motion of the Earth, which he explaineth in this ſort. It agrees to reaſon (ſaith he) that the Water ſhould not altogether follow the motion of the Earth, but ſhould in part bee driuen backe, and in part flow beſides: for ſince it is of a moiſt nature, while the Earth is carried from the Aire about it, the Water is ſomewhat left behind; as wee may ſee in a ſmall veſſell, which is more large then deep: for if it be moued forward, the

Water will leape back to the oppoſite part,& will oftentimes poize it ſelfe hither & thither,ſeeking an æquilibration: when therefore the Earth is a litle caried forward,& the water(as it were)left behind, being out of his *Æquilibrium*, or æquall poize, it will runne to the other part, but beyond the true poize; for the violence of the motion oppreſſed into it in the beginning, from thence, for the ſame cauſe, it will tend againe to the oppoſite part, doing this oftentimes, ſeeking an equall weight, wherein it may reſt:ſo that if the Earth ſhould at any times reſt from her naturall motion, the Water would alſo leaue off the *Libration* to and fro.But becauſe the circumvolution of the Earth is imagined to be perpetuall, the libration of the ſea is alſo perpetuall: ſo farre forth then that this motion is of the continent or Earth, it is onely accidentall in the Water, neither beſides his proper nature, neither according to nature. But ſo farre forth as the Water is in ſome ſort moued in the Earth, it may be ſaid to be according to nature: for it alwaies ſeekes the lower place,becauſe it cannot æqually follow the motion of the Earth. Hence they giue the reaſon, why this motion is not perceiued in Lakes and Riuers, as well as in the maine Ocean:for ſith the motion of the Earth is not very ſenſible,it cannot be perceiued but in a great maſſe of waters.The reaſons to confirme this opinion,beſides the refutation of other opinions,are chiefly theſe two. If the Water by it ſelſe ſhould be mou'd without the motion of the Earth, it muſt needs be moued either *according* to, or *againſt* his nature.But neither of them can be graunted; Firſt, if according to Nature,there would not be one only motion of one body according to nature,but many,which is denyed by *Ariſtotle*; If beſides, or againſt Nature, ſome violent motion would bee perpetuall,which alſo ſeemes abſurd: wherefore it muſt needs follow, that the ſea ſhould moue accidentally: For ſith the Water is conteined outwardly of the Aire, internally of the Earth: And that part of the Aire which toucheth the Water is of *Ariſtotle* called *Stagnans* or ſtanding ſtill, not flowing, as that which is aboue the Earth, but is onely troubled variouſly with windes. This libration or motion of the Water

cannot

cannot bee cauſed by the wind or Aire, wherefore it muſt proceed from the motion of the Earth. The ſecond reaſon may be drawne from the quantity of tides in diuers places of the Earth, for it is found by experience, that the Water ſwels higher & greater in the *maine Ocean*, then in other *leſſer Seas*. For it is obſerued, that about great *Brittaine*, it mounts ſometimes aboue 80 cubits: alſo it oftner ebbes and flowes in leſſer currents, becauſe the ſpaces of this libration are ſhorter and ſtraighter: or becauſe beſides the motion of ebbing and flowing, which the *Mediterranean* ſeas partake from the *Ocean*, at *Hercules Pillars*, they haue a proper libration in their owne channels: whence it comes to paſſe that in ſome narrow ſeas, as in the *Euripus*, beſides *Euboia*, the ſea ſeauen times a day ebbs and flowes: whereof there can no ſufficient reaſon be giuen from the motion of the *Moone* or other cauſe whereto other Philoſophers aſcribe this effect: This opinion of *Cæſalpinus* ſeemes to carry great likelyhood of reaſon and congruity with experience: yet becauſe it is grounded on the circular motion of the Earth, which ſeemes a paradox to moſt men, I dare not warrant it otherwiſe then probable, neither can it well ſtand with the grounds of our *Magneticall* Philoſophers, becauſe they affirme the whole ſpheare of the Earth and Water together with the Aire to moue round with one *Vniforme revolution*, in ſuch ſort as one ſhould not moue to the oppoſite part, or ſtay behind the other; as they would haue it here to doe. There is yet another opinion more commonly defended in the ſchooles of naturall Philoſophers; that this motion of the ſea is to bee aſcribed to the *Moone*, as the principall cauſe: others againe, as they admit the *Moone* to haue her operation in this effect, ioyne other cauſes to it: and indeed this ſeemes more probable: for there want not arguments in *Patricius* and other later writers, to ſhew that the *Moone* cannot be the ſole cauſe of this motion: Firſt, becauſe this motion is not obſerued in all ſeas, Lakes, and Riuers, whereupon neuertheleſſe the Moone hath the like dominion: But experience ſhewes the contrary: for beſides freſh Riuers it is manifeſt by obſeruation of trauailers, that this ebbing and flowing is not to be found in the *Hircan*, *Mantian* and *Dead ſea*, alſo in *Mæotis Palus*, in the *Pontick: Proponticke*, *Ligurian* and *Narbon* ſtreytes, neither in the *Tyrrhene* ſea: Moreouer it is not obſerued in a great part of the *Red* ſea: Neither can the *Narrowneſſe* of the channell excuſe it, becauſe theſe ſeas are great, and alſo for the moſt part within the *Tropicke* of *Cancer*, and therefore expoſed ſometimes to the perpendicular beames of the *Moone*. Secondly: If the *Moone* ſhould by her owne force excite and moue theſe waters, then would it moue thoſe ſeas, which it doth moue, *Altogether* and not only in *parts*. The contrary whereof we may find: Firſt in the *Red Sea*, which in the beginning and end, *Ebbes* and *flowes*, but in the middle not at all: moreouer the *Mediterranean* ſea ebbes & flowes as one ſea, on all the coaſts of *Africa*, wherein it is in a ſort diuided; and yet thoſe ſeas, with which it is ioyned, as the *Tyrrhene*, *Ligurian*, and *Gallican* Seas, feele not any ſuch motion. Thirdly; it is obiected, that if the *Moone* were the only cauſe of this *Flux* and *Reflux* of the ſea, then thoſe ſeas, which are ſaid in whole to moue, ſhould æqually flow in hight: but this is contradicted by experience: becauſe ſome flow higher, and ſome lower, As for example: The *Adriatick* ſea in the inmoſt creeke neere *Venice* ſwels neere foure foote in hight; but the reſt of it, not aboue two foote: which increaſe is likewiſe obſerued in the *Ægean*, *Cretian*, *Ionian*, and *Cyprian* Seas, alſo the *Syrian* and *Ægyptian*, euen to *Portus Ferinæ*: But from *mons pulcher* to the *Herculean* ſtreytes, it increaſeth aboue two foot in length: But without theſe ſtraights, the ſame Ocean by the coaſts of *Portugall* and *Biſcay*, and *France*, the Sea riſeth vſually to 15 foot in hight; and neere the coaſts of *Belgia* and *Brittaine* 18 foot: At the confines of *Briſtoll* to 60, and thence to the borders of S. *Michael* to 60: But at the coaſts of *Æthiopia*, neere the *Atlantick* ſhores, it riſeth not higher then in the *Adriatick* Sea: But neere the Ilands of *Madera*, the *Canaries*, and S. *Thomas*, it ſurpaſſeth not the hight of *Venice*: But in *America*, on the hithermoſt coaſt from *Florida Sinus Mexicanus*, the coaſts of *Braſile* and *Paria*, more then three thouſand leagues, euen to the *Magellane* ſtraights it increaſeth almoſt to two Palmes bredth : but farther South to *Panama*, and all thoſe Southerne ſhores, the ebbing and flowing is of an exceſſiue hight, as may appeare by the coaſts of *Cambaia*, *India*, and *Taprobana*: Thirdly, if the Moone by a naturall vertue ſhould moue the Waters of the Sea, then would it moue the *Ocean* and the *Mediterranean* Seas in the courſe of windes, with the ſame Fluxe and Refluxe in the ſame windes. But this thwarts experience, which is thus proued: The *Mediterranean* Sea, when as it flowes in the *Adriaticke*, *Ionian*, and *Sycilian* Seas, the Water flowes towards the Land, when the Moone is (as the Marriners ſpeake) in *Sirocco* and in *Maeſtro*; but ebbes or flowes backe from the Land, when it is in *Græco atq; Garbinio*: And contrariwiſe the Ocean ſwells when the Moone is in *Græce* and *Garbinio*; but aſſwageth it ſelfe againe when it is carried in *Sirocco* and *Maeſtro*. Fourthly, if the ebbing and flowing of the Sea ſhould follow the Moone, then all places in the ſame diſtance ſhould ebbe & flow alike at like houres. But the contrary is proued by an experiment of *Patricius*, who reports, that at the ſame houre places diſtant 20 degrees, haue bin ſeen to ebbe or flow alike, and the places betwixt alſo to vary and obſerue no iuſt proportion. Fourthly, if theſe Surges ſhould be ſtirred vp by the Moone, then the ſame *ſuperficies* of the Water the ſame houre ſhould bee carried by the Moone: but this is contrary to the obſeruations of Marriners, who haue obſerued, that on the *Norman* coaſts, and that of *Picardy* to *Callice*, the Tide happeneth the ninth houre from Midnight : but ten miles from the ſhore not a full houre, but at the twenty and ſixt mile from the middle of the channell, and vnder the ſame Meridian at 22 houres. Fiftly, if the ebbing and flowing ſhould proceed from the Moone, then ſhould the Water at the ſame houres increaſe and decreaſe : but this is oppoſite to obſeruation : for at *Venice* the Sea is knowne to flow ſometimes for ſeuen, ſometimes for eight; but ebbes in fewer houres, But about the mouth of the Riuer *Senega* in the *Atlanticke*, it is comming in foure houres, but goes not backe vnder eight : ſo about *Gozumnia Oſtia*, the Tide is comming in ſeuen houres, but goes backe in fiue. Sixtly, if the Waters flow by the Moone, then ſhould they bee drawne and carried by the light of the Moone: becauſe all action is by a touching, and the Moone toucheth the Water by her light: but it is found by experience, that at midnight, when the Moone is moſt diſtant in her light, our ſeas doe no leſſe ebbe and flow then when it is preſent: & ſo the Seas neere the *Antipodes* doe ebbe & flow, when the Moone is preſent with vs. 7ly., if the Moone were the onely ancient cauſe of this motion, then the ſame light being preſent the ſame agẽt mouing, the ſame effect ſhould neceſſarily follow. But we find that it produceth two, contrary one to the other: becauſe in her aſcent to the Meridian it is ſuppoſed to lift vp the water, but a little declining from the Meridiã, it is thought to depreſſe & aſſwage the waters. 8ly if this effect were aſcribed to the light of the Moone, then whẽ the Moone ſhines not, there ſhould be no ſuch motion, becauſe contrary cauſes produce contrary effects. But wee obſerue the ſame ebbing & flowing in the cõiunction or New Moon, whẽ ſhe hath no light, as in the full Moone, when with full face ſhe beholds the Sea: for in both theſe times we haue higheſt tides These & many more argumẽts are vrged by *Patricius*, to ſhew that the Moone cannot be the cauſe of this motiõ in the Sea: of the other opiniõ, that this effect is aſcribed to the Sun, amongſt others I find the chiefe patron to be *Teleſius*, who taught that the Sea was moued in this wiſe, becauſe it would auoide the operation of the Sun, fearing leſt it ſhould be too much diſſolued into vapours, and ſo periſh. But this opinion ſeemeth far more weake then the former. For firſt I would aske concerning this motion, wherein it is thought to auoide the Sunnes heat, whether it be voluntary, or neceſſary? It cãnot be Voluntary, or a free action, becauſe the Sea is no liuing creature, to which only ſuch a motion is incident: If it be neceſſary, then it is Naturall or Violent: It cannot bee Naturall, becauſe according to *Ariſtotle*, one Body can haue but one naturall motion, but the Water being a ſimple Body, hath another motion to fall downewards towards the Center: wherefore it cannot alſo admit of this. It cannot be violent: firſt, becauſe no violent thing can be perpetuall. Secondly, no cauſe can be thought vpon Externall, which ſhould cauſe this violent motion: and if any ſuch cauſe there be found, then is not this of *Teleſius* the firſt and principall cauſe, ſith it is referred to a farther cauſe: Thirdly, no cauſe can here be ſhewne according to this opinion, why all other waters, as freſh Riuers, ſhould not likewiſe ſtriue to hide themſelues from the face of the Sun. Fourthly, hee ſhould giue a reaſon why in the *Belgicke* and *Armoricke* ſhores, which are far more diſtant from the Sun, the ſame motion is no leſſe eminent then in *Taprobana*, which is ſubiect to the Torride Zone; and why in the Iland of S. *Thomas*, which is immediatly vnder the Equatour, there is not a greater working of the Water then at *Venice*. Fifthly, that which *Teleſius* brings to confirme his opinion, is no leſſe warrantable then the maine point in controuerſie. In the Summer (ſaith he) the flouds are leſſer, becauſe the Sun raiſeth vp thinner vapours, which are eaſily diſſolued: But in the Winter they are leſſe, becauſe the Sunne is of leaſt force, and ſo raiſeth vp fewer vapours to worke vpon the Sea: But both theſe matters are proued falſe by experience: firſt becauſe in the Summer wee haue as great a working of the water as at other times: In the Winter alſo as great, or greater. Secondly (ſaith the ſaid Author) in the full Moone the motion is greater, becauſe the much light ariſing from the Moone, drawes vp many vapours. In the New Moone; becauſe the Aire being refrigerated, the internall Heat of the ſea collecting it ſelfe, is made ſtronger with more vapours: In the quarters of the Moone, becauſe there is not much light caſt from the Moone, and the Heat of the ſea is not ſo much collected by the externall cold of the Aire: To all theſe matters wee may eaſily anſwer: Firſt, how can the Moone beſtow any light on our ſeas, when ſhee is with the *Antipodes*? Secondly, where he ſaith, that the internall Heat is gathered together, and made ſtronger by externall cold; 1 Firſt I aske how the ſea can ſend forth theſe vapours; if the vapours kept vnder doe raiſe the ſea vp; or if the Sea ſwell with theſe vapours in her wombe, how can ſhe let them out? 2 How will he proue the Sea naturally to be hot, ſith it is one of the cold Elements? Thirdly, where he ſaith, that the light of the Moone is but in halfe imparted to the Sea; why ſhould not the Sea proportionally in halfe be ſtirred vp? wherfore *Patricius* and *Caſman* finding neither the Sunne nor the Moone of it ſelfe to be a ſole or ſufficient cauſe of this motion, hauing ioyned them both together in this cauſality, and added beſides other particular cauſes: firſt (ſay they) there are two kind of cauſes concurring to that effect: either *Vniuerſall* and *externall*; or *Particular*, *internall* and next cauſes. The *Vniuerſall* cauſes are two; to wit, the *Sunne* and the *Moone*. The *Sunne* (ſaith he) with the heat of his beames and light doth *conſerue, viuificate*, and ſtirre vp to action, the *Internall* and *originall* heat in all things here below. This Heat being ſtirred vp and viuificated, all things are made fit for motion, and being ſo accommodated, are ſtirred vp to motion, as if from an *Internall* life they ſhould be promoted to an *Externall*: for as in the *primary* life of things, the motion and action is ſhewn in the *Eſſence*, in the *ſecondary*, the action and motion outwardly in reſpect of other things: ſo the firſt and originall heat of the Sea, cheriſhed, & ſtirred vp by the external heat of the Sun, driues the Ocean, and moues it to action. The *Moone* alſo *cheriſheth, preſerneth, viuificates, nouriſheth*, and *ſtirres vp* to motion, all theſe earthly *humours* and moiſtures: and as ſhe dayly by houres beholds the Sun as her darling and by him is (as it were) big-bellied with liuely ſeedes, ſo ſhe beholdes her loue, the *Ocean*, dayes and nights, and fills the Ocean with theſe ſeeds which ſhe receiues from the *Sunne*. But this cannot be performed without her *motion*, without the diffuſion of her *light*, without the *effuſion* of her *influēce* & ſeeds; wherefore it cannot otherwiſe bee, but all our humours and moiſtures ſhould be made fruitfull, conceiue life, bring forth, beare fruit, and be ſtirred vp to life and motion, by the motion of the *Moone*, through the *Aſpect* of the Moone with the *Sun*, with the *Earth*, with the *Ocean*: wherfore all *lower* moiſtures are ſubiect to the power of the Moone: Notwithſtanding all are not æqually vnder her dominiō; ſith all are not of the ſame ſubſtance, of the ſame Rarity, or *denſity*, or of the ſame Heat.

This much of the vniuerſall cauſes of the motion of the Sea, according to this opinion. The particular or neerer cauſes are ſuch as are found in the Nature of the Sea it ſelfe: and theſe are two: the fluidity deriued from the Radicall and firſt moiſture; and the ſaltneſſe drawne from the originall, and imbred Heat in the Sea. That is moſt ſubiect to the dominion of the Moone, this of the Sun: The ſaltnes therfore of the Sea ſeemes the neereſt and moſt proper cauſe, and no other common Nature, why the Sea ſhould be ſtirred with ſo many motions: for no freſh water is moued with ſo many, nor ſuffers any ſuch Fluxe and Refluxe as the Sea. Then muſt the ſaltneſſe bee the neereſt and moſt proper cauſe: But by what meanes doth it worke? It is anſwered by *Patricius*, that ſalt water hath in it more heat then any freſh water whatſoeuer; And though ſpirits bee hid in all moiſture; yet farre more in ſalt, then freſhneſſe: wherefore from theſe ſpirits exiſting in the ſalt humor, is the Sea turned and toſſed with ſo many motions: amongſt which, the chiefeſt and moſt remarkeable of all is that of the Ebbing and Flowing of the Sea: for by theſe motions, the Sea as a Terreſtriall Heauen, followes and imitates the ſuperior; wherefore it ſeemes euident, that from ſuch a motion ſhould be deriued the motion of the Sea. This opinion ſeemes to haue great ſhew of probability, and to bee more ſound then all the reſt: but whether it will in euery part ſatisfy, I much doubt: yet muſt wee embrace it, vntill ſuch time as a better be found out.

2 *All ſeas doe not ebbe and flow alike: Neither the ſame at all times.*

That a great diſparity is found in diuerſe places of the ſea, concerning the afflux and reflux of the Water, is manifeſt out of many inſtances, we haue ſhewed in the former propoſition: it will bee enough in this place, to giue ſome reaſons for this variety. This diſparity then is found to bee two-fold; for ſome ſeas neither ebbe nor flow at all: others ebbe and flow: Againe ſome ebbe and flow more, others leſſe. Againe in reſpect of time we ſhall obſerue beſides daily comming and going of the Waters, Weekely and monthely change, of all which branches we ſhall haue occaſion to treat hereafter according to thoſe footſtepps, which I finde in the beſt writers. Firſt therefore the want of this motion of ebbing and flowing in the ſea, is by ſome Authors aſcribed to many particular cauſes. 1. The *Freſhneſſe* or want of ſalt in the Water. 2. The *Craſſitude* & thickeneſſe of the water 3. The ouermuch *thinneſſe* of it. 4. The extreame *depth* of it. 5. The *narrowneſſe* of the *Channell*: All which either ioyned together, or in part, may hinder, if not altogether take away, the ebbing and flowing of the ſea in thoſe parts: which we ſhall the better vnderſtand, if we inſtance in ſome particular ſeas moſt remarkeable: The *Caſpian* ſea is reported to be of this condition (although ſome haue doubted,) that it neither *ebbs*, nor flowes: This affection is imputed to two cauſes: Firſt, The want of *ſaltneſſe*; Secondly, the extreame *depth*: By the former it is vnapt to generate *ſpirits*, which ſhould giue a motion: And by the later, the *Sunne-beames*, which concurre to the ſtirring vp of theſe ſpirits, are hindred from piercing to the very bottome of the Water. That this ſea ſhould little partake of *ſaltneſſe*, may eaſily be perſwaded; foraſmuch as 80 Riuers of freſh water, with 5 Lakes of no ſmall quantity, are disburthened into this ſea: Among the which are *Ockus* frō the *Eaſt*; *Cirus* frō the *Weſt*, *Araxis* from the South, falling into it with 40 Inlets and *Volga* from the North, running into it with 70. Inletts. All which freſh Riuers, ſome of them exceeding great, muſt needs make this ſea very freſh. To this may bee added, beſides the authority of *Contarenus*, confirming this by two other reaſons: Firſt the *Trouts* and *Lampreyes*, which is a kind of Fiſh altogether delighting in freſh Water, are there taken in great abundance: Secondly, that on a certaine coaſt of it, the Water of it's owne accord congeales into ſalt: The reaſon whereof is, becauſe *ſalt* Water mixt with *freſh* will more eaſily *coagulate* and congeale into ſalt. The depth of this ſea is alſo ſufficiently warranted by ſuch as write of it, eſpeciall the former named *Contarenus*. Secondly, the Lake called *Aſphaltes* is thought neither to ebbe nor flow: which beſides theſe reaſons alleaged from the *Caſpian Sea,* may be aſcribed to the *thickneſſe* of the water, not ſuffering any thing to ſinke into it: So that for the craſſitude of it, it muſt needs be heauier then other Water, and ſo, more vnapt for motion. Thirdly, it is recorded by ſome that in the inmoſt creeke of the *Red ſea* there is a motion: and ſo in the mouth of it, by reaſon of the *Ocean;* but in the middle no ſuch matter is to be obſerued: which ſtrange effect ſome aſcribe to the *Thinneſſe* of the Water (one of the cauſes aboue named) begetting *fewer and weaker Vapours* and *Spirits:* which either ſtreightway breath out, or are too weake to raiſe vp the Water. This thinneſſe is confirmed to be in that midle part of the *Red ſea,* not onely out of the authority of *Iohn Barro,* out of the experiments of *Iohn de Caſtro,* which found this Water to be cleare and liker to Chriſtall, then that of other parts; but alſo by the cleare perſpicuity of it: For in almoſt all the ſea may the bottome plainly be ſeene. Fourthly, we reade the like of the *Baltick* ſea: that it neuer ebbes or flowes, which *Bartholomew Kackerman,* that countri-man, aſcribes, 1. To the *Narrowneſſe* of the channell: 2. To the *depth* of it,. 3. To the *northerne ſituation*: which cauſe I thinke hee might well haue ſpared, conſidering that more *Northerne* ſeas then that, both ebbe and flowe. Fiftly: it is reported of *Maotis*, *Pontus*, and *Proppotis*, that they flowe from the one to the other, but neuer ebbe: For *Maotis* flowes into the *Pontick* ſea as from the Higher place into the lower: and the *Pontick* into the *Propontick,* & *Ægean* for the ſame cauſe, but returne not back againe. But beſides this cauſe of this declinity of the ground, it ſtandes with reaſon, that the Water ſhould be freſher then that in other places of the ſea: For firſt, all of them receiue into them many and great Riuers of freſh Water: for *Maotis Palus*, beſides other partakes of *Tanais*. Into *Pontus* fall according to *Arcanus* report about 52 freſh Riuers: whereof the chiefe are *Iſter, Hiſpanis, Boriſthenes, Tanais, Phaſis,* all great currents. Secōdly the forenamed fiſhes, which delight in freſh ſprings are here alſo found in abundance, Beſides this freſhneſſe (if wee beleeue ancient writers, as *Pliny* and others) it is a ſea of extraordinary depth; ſo that for this cauſe ſome part of it was called *Negrepont*, or the *blacke-ſea*: Which blackneſſe was by ſome, thought to ariſe from the depth of it: wherein in many places, they could ſound no bottome. Sixtly, it is teſtified of the *Tyrrhene*, *Ligurian*, and *Narbon* ſeas, that they ſuffer not this motion: The cauſe of which is onely aſcribed to the extreame depth; for few or no Riuers are diſburthened into it, except *Rhodanus*: We are in the next place to ſhew, why this working of the ſea is more in one place then in another: The reaſons whereof (although many be thought on) are chiefly reduced either to the exceſſe of ſaltneſſe in the water, or the narrowneſſe of the channell, into which from an open place the ſea is to be diſburthened, or the ſhallowneſſe of the ſhore: All which either concurring together, or taken by themſelues apart, may cauſe the ſea to ſwell more in one place thē another; which may, as the former, bee proued by diuerſe Inſtances. Foure Seas are more particularly noted to flow and ſwell higher then other. The firſt is that compaſſeth about *Europe* from *Hercules pillars*, which according to diuerſe ſhores, takes diuerſe names; as the *Portugall*, *Cantabrian*, *Gallican*, *Belgicke*, and *Britiſh* Seas. And in the New World, or *America*, the Southerne Sea ſhall be the ſecond: The third is that of *Cambaia* and *India*: The fourth is that which compaſſeth about *Taprobana*: for the three laſt, the cauſes fore-ſpecified, ſeeme manifeſtly to concurre: for *Taprobana* is reported by *Pliny* to haue a ſhore not aboue ſixe paces deepe, and the Sea to be greene and ouergrowne with weeds, in ſo much that the tops of the weedes fret their ſhips; and later Writers report, that the Land is knowne to augment the confines by reaſon of the ſhallowneſſe of the Water: ſo as wee haue ſhewed that ſome Seas neither ebbe nor flow by reaſon of the depth of the channell; ſo on the other ſide muſt it follow, that other Seas ebbe and flow more by reaſon of the ſhortneſſe and ſhallowneſſe of the ſhores: for of contrary cauſes proceede ordinarily contrary effects. Moreouer it ſtands with experience, that in any Water or Sea, where the flood is *ſtopped* and hindred by quicke-ſands, it returnes with greater force, as it were enraged,

ged, and ſwels ſo much the higher, which is the cauſe why in the coaſts of *Cambaia* it is lifted vp ſo high, becauſe the ſhores are ſo ſhallow, and ſo ſhort, and expoſed to impediments, that in the ebbe, the Sea runs backe many miles, & leaues the ſands vncouered: Whence it muſt needs returne with greater violence. This alſo is found in the *Indian* Sea, and neere *Panama* in the Southerne Sea, where the Sea rūning back for two leagues, certaine *Ilands* and *Lands* are left naked; ſo that in theſe three Seas here named, the Sea ſeemes to enlarge its limits in bredth more then in other places; to which we may aſcribe this effect. For the Seas about *Europe*, wee may pronounce alſo that for the moſt part they haue ſhort & ſhallow ſhores, as may eaſily appeare in the confines of *Belgia:* But it may be obiected of the *Engliſh* ſhores, that they ſwell very high, albeit the depth of the Water in the middle is found to be 144 foot: Here muſt we haue recourſe to the other cauſe, the flowing of a large & wide ſea into a narrow channell: for the large torrents of water running ſwiftly into a narrow channell, being hindred on both ſides by the ſhores, from ſpreading it ſelfe in bredth, is enforced to ſwell in hight: ſo that the effect is rather to be aſcribed to the violence of a great current, enboſoming it ſelfe into a ſtreite channell: which may more euidently ſhew it ſelfe in 3 inſtances: For in the ſtreite chanels of *Zeland* and *Holland* it is lifted vp about three foote: At *Briſtoll* in *England*, by reaſon of a greater force of Waters running from the Sea into a more narrow channell, and ſeconded by the maine Ocean at the backe, it ſwels to the hight of 60 foote: In the *Armorean* ſeas, where larger ſeas are emptied into more narrow ſtreites then the former, it increaſeth to 90 foote: Out of which experiments may wee plainely collect, that to the increaſe of the motion of the ſea beſides the ſaltneſſe of the Water, two other cauſes are concurring; to wit, the ſhallowneſſe of the ſhore, and the ſtreitneſſe of the channell, wherein a great and large ſea is to bee exonerated. This may laſtly bee farther illuſtrated from the diſparity of theſe ſeas with others, for in the *Adriaticke*, *Egaan*, *Ionian*, and almoſt all the *African* ſeas, the ſea ſeldome ſwels to ſo great a meaſure: whereof the cauſe is as well the depth of the ſeas,as the equality of the ſhores : for as the depth is a cauſe that ſometimes it flowes not at all , and the inequality and ſhortneſſe of the ſhore that it flowes high : ſo a meane hight of the Waters from the bottome , and a more equall figuration of the coaſts may bee a cauſe of an indifferent working of the Water. Hitherto wee haue ſhewed the variety of motion in the ſea, in regard of the diuerſity of places : wee are next to ſpeake ſomething concerning the variation of it in regard of the times , which , though it properly appertaine not to Geography , yet am I loath to leaue it out , becauſe the diſcourſe is pleaſant. Concerning which point , the Marriners make ſix degrees of change in the tides according to the times. Firſt diurnall , whereof wee ſpeake in this diſcourſe: The ſecond Hebdomedary,or weekely which *Poſſidonius* called monethly or weekely ; becauſe it is diſtinguiſhed by ſeuerall weekes of a moneth : but tarries not till the end of the moneth : For it is found by experience of Nauigatours that a day before the coniunction of the Moone with the Sunne , and the day of coniunction , and a day afterwards , the ſeas in the maine *Ocean* haue their greateſt flowes and ebbes , being lifted higher and laid lower downe , and then the tides are moſt ſwift : The fourth day from the coniunction, the tide is leſſe and leſſe ſwift : The fift yet leſſe then then the former ; and the ſixt day leſſe then the fift : But in the ſeuenth day,which is a day before the quarter,and in the eight following,wherein it is *halfe-faced*; and in the ninth, which is a day after the quarter, the ſea is , as it were , dead , not much ſtirring , neither much ebbing or much flowing ; which was (as it ſeemes) only obſerued by *Pliny* in the *Euboian Euripus*; but whether it ſo happen elſe-where , I leaue to men experienced in theſe matters ; This motion as it doth encreaſe according to the age of the Moone : So it is ſaid proportionally to decreaſe againe. The third motion is monethly, which ſeemes in the time of the cōiunction, wherein the ſea-tides are higheſt and ſwifteſt. The fourth is called *motus ſemeſtris* or *ſix-monthly* , happening at the times of the Equinoctiall ; differing one from the other like monethes ; The fift is called *Trimeſtris* , becauſe it happeneth onely in three moneths diſtance. The laſt is Annuall which *Patricius* witneſſeth that himſelfe ſaw in *Liburnia*, in the moneth of *January*. Theſe motions I careleſly paſſe ouer, becauſe the diſtinction ſeemes to me full of vncertainty and ſcarce warranted; and ſuch experiments as are brought for the proofe of it concerne rather particular places, then the generall nature of the ſea.

3 Hitherto of the generall motion of the ſea: The *Speciall* is that, which is obſerued in ſome ſpeciall places.

1 *It is probable that the ſea is carried ſomewhere from* East *to* West, *and ſomewhere from* North *to* South, *and contrariwiſe.*

It hath beene a receiued opinion amongſt Philoſophers of this later age, that the ſea by the rapture of the heauens ſhould be moued round, as it were, in a diurnall courſe: which they haue laboured to proue by diuers experiments. Firſt, becauſe it is obſerued by Marriners that a ſhip can well ſaile from *Spaine* into *America* with an indifferent winde in 30 dayes, when ſhe can hardly returne vnder three moneths, which they aſcribe to the circular motion of the ſea: For a ſhip going from Eaſt to Weſt ſailes with the Water, but from Weſt to Eaſt againſt the ſtreame, ſo that the one muſt needes bee ſwifter and the other ſlower. Their ſecond experiment to confirme this point, is of a ſhip ſayling from *Spaine* to *Holland*, which may as they ſay ſwifter returne backe then goe thither. To this motion of the Water from Eaſt to Weſt, *Iulius Scaliger* hath added another, which he would haue to be from North to South, from *Terra Laboratoris* Southward. But *Patricius* not denying theſe motions, would haue many more in diuerſe ſeas, not admitting any vniuerſall circular motion enforced by the heauens, but various motions diuerſly diſpoſed in diuers ſeas, for which hee giues many inſtances, ſome whereof wee will here relate. Firſt going about to diſproue

Scaligers opinion and experience, hee brings the experiment of the *Portugall* Nauigatours, who teſtifie that they came from *Moſambicke* of the ſide on *Madagaſcar* into *Malebar* in 28, ſometimes in 30, other times in 35 dayes: which is farre from the accompt of *Scaliger*, who would not haue a ſhip to paſſe it under three moneths, out of which he laboured to proue this motion of the ſea, becauſe the ſhippe was longer a going then returning. The ſecond experiment hee takes from the obſeruation of one *Iohn Eupolius*, who willing to paſſe from the port of S. *Blaſius*, which is beyond the *Cape of good hope* in *Africke* to *Melinde* towards the Indies, could not goe forward by reaſon that the currents, (as they call them (droue them backe from *Melinde* to *Pate*, a towne by this ſide of the Indyes: whence hee would conclude that the Water ſhould in this place rather runne from Weſt to Eaſt towards the *Indies*. The third experiment is drawne from the teſtimony of *Thomas Lope*, who when he was to paſſe from the *Cape of good hope* towards the *Indies*, teſtifies that the current of the Water was ſo violent, that it oftentimes leapt into the forepart of the ſhippe. The fourth is from the teſtimony of *Iohannes Guietanus*, who putting forth from *Tidor*, came into *Spaine* before the ſixteenth moneth: This iourney from *Tidor* to the *Cape of good hope*, containes 55 leagues, which makes 1650 miles: from this to the Iland of S. *Helena* by the relation of another pilot are 1400 miles: from whence to the Equinoctiall circle are 1600 miles: from hence to *Spaine* by the computation of degrees, are not aboue 1520 miles: of all which the ſumme is, 7114. Now if wee take out of ſixteene moneths 49 dayes, wherein the ſhip againſt *Cape of good hope*, was carried hither and thither (which the marriners call *Voltegiaire*) and 70 other dayes wherein it ſtood ſtill in the coaſts of *Guinea* in *Melacia*, there will remaine a whole yeere ſpent in this iourney: which dayes if we diuide by thoſe 7114 miles, there will be allotted to euery day no more then 19 miles, which euidently ſhewes that this iourney was moſt ſhort in reſpect of the ſwiftneſſe of the Nauigations. For if the Ocean ſhould driue his currents to St. *Helena* euen to the weſt, they had ended their iourney in a farre leſſer time, becauſe thoſe currents (as they ſay) carry the ſhip. But this iourney was accompliſhed very ſlowly: wherefore the currents were not carried from Eaſt to Weſt, as *Scaliger* relates. Likewiſe from ſundry other experiments, hee goes about to proue that it conſtantly cannot bee obſerued to flow from North to South, as the ſaid *Scaliger* affirmes, but that it is various according to diuers places. Neuertheleſſe, that the Sea ſhould haue a perpetuall current from the Poles towards the Equatour; ſeemes to ſtand as well with Reaſon, as Experience: For all men muſt needs confeſſe, that the motion of the Heauens vnder the Equatour, muſt bee much ſwifter then neerer the Poles, becauſe the circles of it are greater neere the Equatour. Now by how much ſwifter the motion of the Heauen is, by ſo much more is the Rarefaction of the Aire, or other Elementary bodies right vnder it: whether it be Aire (as it is moſt probable) or Fire as *Peripateticks* imagine: But howſoeuer we determine that controuerſie, it muſt needs be that the Aire muſt ſuffer Rarefaction, anſwerable to the ſwiftneſſe of the motion: if not immediatly by the ſwift motion of the Heauens, yet by a conſequent by the greater feruour of the Fire, which vnder the Equatour muſt needs be greater and of more force then about the Poles: whence the parts of the Aire vnder it, muſt partake more degrees of Heat, and by neceſſary conſequence ſuffer a greater Attenuation. 2 The Sun-beames being darted perpendicularly, cannot chooſe but attenuate and rarifie the Aire more vnder the Line, then in places more declining to the Poles. This ground thus laide, theſe two conſectaries will follow: 1 That the Aire thus attenuated, muſt needes take vp a larger place then it before poſſeſſed, which cannot be but by inlarging it ſelfe towards either Pole, either North or South; whence the parts of the Aire in thoſe places muſt bee more thickned and condenſated. 2 That theſe parts of the Aire carried towards the Poles, and meeting with the cold Regions of the North and South, muſt by condenſation turne into water, and ſo fall downe in Raine or Snowes; whence the Water encreaſing neere the Poles perpetually, muſt haue a perpetuall current towards the Equatour, where they are againe exhauſted in vapours by the Heat of the Sunne; in ſuch ſort, that as well the parts of the Sea betwixt themſelues, as the waters in regard of the Aire, may proportionally maintaine themſelues by the mutuall tranſmutation. To this reaſon ſome haue added another, that the Sunne ſoiourning in the Southerne Signes, is neerer to the Earth, then when hee is in the North, by the whole Latitude of his excentrice, and therefore of greater force to draw the water toward the South: But whether this Reaſon be of any great force, I will not ſpent time to diſpute: let euery man vſe his own iudgment. It ſeemes to me a coniecture not improbable, that theſe currents may bee alſo varied according to diuers reaſons of the yeere; as alſo according to diuers channels, by diuers croſſings and doublings of the Tides, as wee find in diuers places: but I will not be too bold in this opinion, becauſe I loue not to walke without a guide in theſe vncertainties.

4 Of the Naturall motion of the Sea we haue ſpoken: It remaines we ſpeake ſomewhat of the *Violent*: The *Violent* motion is that which is ſtirred vp by windes.

The conſideration of windes is either abſolute or reſpectiue: Abſolute I call that wherein the Naturall effects and properties of the winds are handled; which properties belong to the naturall Philoſopher, they being (according to *Ariſtotle*) a Naturall body vnperfectly mixt: The Reſpectiue conſideration is that wherein the windes are conſidered in reſpect to the Terreſtriall Globe. This Reſpect againe twofold, either in regard of the whole Spheare of the Earth, whereof they deſigne out the points of the Horizon by certaine lines called *Rhumbas*; or elſe in reſpect of the Sea, to which they giue a motion. The former reſpect we haue handled in our firſt booke of *Geography*: The later is more proper to this place; & howſoeuer the wind is an exhalation, common as well to the Earth as to the Sea, affecting both with ſome alteration; yet becauſe it more neerely affecteth the Sea as his proper Prouince and Dominion, and hath for the moſt part beene moſt obſerued of Sea-men and Marriners; Wee thought fit to treat of it in this place. Of windes ſome are vncertaine and various, which in all places interchangeably ſupply their turnes, keeping no certainty or regularity in times or places: others are called, ſet or ſtanding windes, becauſe they are obſerued to blow at certaine times and places: of both which, as much as concernes our purpoſe, we ſhall ſpeake in theſe two Theoremes.

1 *To ſome certaine places, at certaine times belong certaine windes.*

Theſe windes are by ſome, called *Anniuerſary*, becauſe they blow at a certaine ſeaſon euery yeere; of theſe there are many kindes mentioned by Nauigatours. The firſt and chiefeſt is that which they call the *Eteſian* winde, which is obſerued to blow euery yeere from the Northeaſt about the riſing of *Dog-ſtarre*, and oftentimes continues about 40 dayes. This wind driues the Seas from *Pontus* into the *Egean* Sea, euen ſo farre as *Egypt*. In the ſecond place may wee range ſuch windes as are called *Chelidonian*, becauſe they ariſe at the firſt comming of the Swallowes. It blowes ſometimes from the *Direct-weſt*, ſo that of ſome it is taken to be the ſame: Sometimes from the *North-weſt*, ſo that with others it is accounted among the North windes: Theſe *Chelidonian* winds driuing from the North or North-weſt ſtill fill all the *Mediterranean* euen to the coaſts of *Syria* and *Paleſtine*, and continue in the ſummer time for many dayes together. In the third place may we accompt that winde, which *Columbus* perceiued on the coaſt of *Portugall* comming ouer the *Atlanticke* Ocean, which at ſome times of the yeere was carried higher, at other times cleauing (as it were) to the boſome of the Sea, whence hee probably coniectured that it was deriued from ſome moiſt land, whereon hee aduentured on the firſt ſearch of *America*, and layed the firſt worke of that diſcouery. Fourthly to theſe windes may be reduced thoſe yeerely flowings of the *Perſian* and *Indian* Seas, which the *Portugall* marriners call Motions. The *Perſian* Sea ſuffers ſuch a kind of motion euery yeere while the Sunne runnes through the *Southerne* degrees, and when he arriues at the end of *Sagittarius* it is ſhaken with an extraordinary great tempeſt: On the contrary ſide the *Indian* Sea, while the *Perſian* is moued, is obſerued to reſt without any great motion; and when the *Perſian* is ſtill, it ſuffers great motion, eſpecially when the Sunne firſt enters into *Cancer*. This laſt motion ſeemes to be not only deriued from the *Prouinciall* windes, but ſome other concurrent cauſes; whether theſe winds are the cauſe of the currents before ſpoken of, is a very diſputable point, which I leaue to others to ſearch out. Of euery ſet winde blowing a part of the yeere on the coaſt of *America*, *Acoſta* treats at large, to which hee aſcribes the currents foreſpoken of in this chapter.

2 *The violence of windes makes the Sea ſometimes in ſome places, tranſcend his ordinary bounds.*

How far the Sea by violence of windes hath treſpaſſed on the land, many haue learned to their great loſſe and calamity. It is obſerued ſometimes in the *Venetian* ſhores, that the Sea driuen with winds ſwels ſo high, that ouerflowing all the banks and channels, the Inhabitants are enforced to row in boates from houſe to houſe: Their ceſternes are infected with *Salt-water*, and their precious waters in vaults and cellars ſpoyled. The like hath heretofore beene found (if we will credit Hiſtories) in the *Belgicke* Sea, on which the Northweſt windes blow with ſuch vehemency and ſo long that it brake downe the ordinary banks; and in *Zeland* and *Holland* ſwallowed vp many townes with infinite multitudes of people. Which ſeemes to be warranted by a report, I haue heard of many trauaylers, that in a calme tide the topps of towres and ſteeples haue beene ſeene aboue the water. Beſides theſe inſtances, we may adde the teſtimony of *Strabo* and *Ariſtotle* in his booke *de mundo*: with diuers other relations of ſtrange inundations whereof wee ſhall haue more occaſion to ſpeake hereafter.

CHAP. VII.

Of the Depth, Situatio, and Termination of the Sea.

1 THe Abſolute proprieties of the Sea being hitherto paſſed ouer: we will conſider next the comparatiue: which agree to the Sea no otherwiſe then in reſpect or compariſon with the Earth; which are chiefly three; 1 *Depth*, 2 *Situation*, 3 *Termination.*

2 The Depth or Profundity is the diſtance betwixt the Bottome and the Superficies of the Water.

To find out the Abſolute depth of the Sea, is a matter of the greateſt difficulty, and by many thought impoſſible, in reſpect as well of the immenſity of it in many places where no line could, as of the various places, too many to bee ſerched out by mans induſtry: yet where abſolute ſcience failes, there probable coniecture takes place, and is beſt accepted, which wee will venture to propoſe in this our Theoreme.

1 *The ordinary* depth *of the Sea is commonly*

anſwerable to the ordinary hight of the maine land aboue the water; and the whirle-pooles and extraordinary depths anſwer to the hight of the mountaines aboue the ordinary hight of the Earth.

It hath been a common receiued opinion among ancient Coſmographers, that the depth of the Sea being meaſured by a line and plummet, ſeldome exceeds two or three miles, except in ſome few places neere *Sueuian* ſhores, and ſome places about *Pontus* obſerued by *Pliny*. But as *Breedwood* a worthy late writer obſerues, this poſition is not to be vnderſtood generally, but only of the depth of the Streits or Narrow Seas, which were perhaps onely ſearched by then ancients who dwelt far from the maine *Ocean*: But another accompt is neceſſarily to be giuen of the maine *Ocean*. This being a matter of great vncertainty, wee will follow the conceit of the forenamed Author. It hath been ſhewed in the former Chapter, that the moſt probable opinion concerning the manner of the firſt ſeparation of the dry land from the waters would haue the Earth by the Creation to be cut into diuers ſluces & channels, apt to receiue Water. Now theſe materiall parts of the Earth, being taken out to giue way to hollowneſſe, were not vtterly annihilated, but by an almighty hand in ſome other places, making by their addition the ſuperficies of the Earth in ſuch places higher then before: whence by reaſon it ſeemes to bee collected, that the ordinary Eminency of the hight of the Earth aboue the Waters, ſhould bee anſwerable to the ordinary depth of the Sea. And if Hills and Mountaines be compared, wee may ſet them againſt the Deepes and extraordinary While-pooles and Gulfes: And ſo betwixt the Sea and Land, and the parts of the one and the other we may ſettle a kind of agreement and proportion: In a matter of ſo great vncertainty, no man will expect an euident domonſtration.

3 The Site is the poſition of the Sea in reſpect of the Earth.

Concerning the ſite of the Sea in reſpect of the Earth, wee muſt conſider the Water and Earth two wayes: Firſt Abſolutely as they are Elements and ſolide Bodyes: Secondly, in reſpect of the ſuperficies of either: if we conſider the whole ſolide Body of the Water as that of the Earth, we muſt confeſſe without all doubt, that the Water hath the higher place, being lighter then the Earth; of which ſituation wee haue ſpoken in the firſt booke: for although ſome parts of the Earth are thought (by moſt as we ſhall proue) to be aboue ſome parts of the Water, yet is this of no ſenſible proportion in reſpect of that vaſt Maſſe of Earth, couched vnder the Waters betwixt them and the Center of the World. But the queſtion is here of the ſuperficies of the Water, compared to the ſuperficies the Earth vncouered, which ſhould be higher in place; of which ſhall be this Theoreme.

1 The ſuperficies of the Sea is ſome-where higher then the ſuperficies of the Earth; ſome-where lower.

There hath beene a great diſpute among Phyloſophers concerning the poſition of the Sea in reſpect of the Land, whether it bee higher or lower: ſome haue beene of an opinion, that the Water is higher; which opinion was defended by *Tully*, in his Booke *De Natura Deorum*, where hee ſaith, that the Sea being placed aboue the Earth, yet couering the place of the Earth, is congregated and collected, neither redounding, nor flowing abroad: which afterwards ſeemes to be ſeconded by diuers learned Diuines, who reducing moſt things to the ſupernaturall and firſt cauſe, diuers times neglected and ouer-ſlipt the ſecond. Hence Saint *Baſil* in his 4 *Homily* on the *Hexameron*, leſt the water (ſaith hee) ſhould ouerflow and ſpred it ſelfe out of the place it hath occupied, it is commanded to gather it ſelfe together: otherwiſe what ſhould hinder the *Red Sea* to ouer-flow all *Egypt*, being lower then it ſelfe, vnleſſe it were manicled with the Creatours power, as it were with fetters: to which alſo afterwards ſeeme to ſubſcribe *Aquinas*, *Dioniſius*, and *Catharinus*, with diuers other Diuines, who held that the firſt diſcouery of the Earth, and the gathering together of the Waters in the firſt Creation, was made not by any mutation in the Earth, but by a violent accumulation of the Waters, being (as it were) reſtrained and bridled ſupernaturally, that they could not tranſcend certain limits and bounds. To confirme this opinion, ſome reaſons are alleaged by moderne Philoſophers: firſt becauſe it is the order of all the Elements amongſt themſelues, that the Earth, as the heauieſt, ſhould take the lower place, and the water ſhould aſcend aboue: Secondly, becauſe Marriners comming from the *maine Ocean* to the Land, ſeeme to ſee the land farre lower then the Water: Thirdly they alleage that place of *Iob*, where God himſelfe profeſſeth, that he hath bounded the Waters, in theſe words: *Hitherto ſhalt thou come, and no farther, & here ſhall thy proud waues be ſtayed*. But this opinion ſeemeth very improbable, that God in the firſt inſtitution of Nature, ſhould impoſe a perpetuall violence vpon Nature: ſith we ſee the Creator in other matters to vſe Nature as his ordinary ſeruant, and to adminiſter the Regiment of things by ſecond cauſes. Neither were the authority of theſe Diuines ſo great in theſe *Coſmographicall* conceipts, to ouerſway theſe of the ſame profeſſion, who could more exactly iudge of theſe matters. Neither are theſe reaſons of ſo great validity as to enforce aſſent. For firſt whereas *S*^{t} *Baſill* ſeemes to wonder why the *Red Sea* ſhould not ouerflowe all *Ægypt*, if it were not ſupernaturally bounded; he takes that as granted, which is the queſtion in controverſie, that the Water is higher: for which he can produce no other reaſon, then the Teſtimony of the ſenſe: but this is very weak, foraſmuch as in ſuch matters the ſenſe is oftentimes deceiued, as ſtands well with the grounds of the *perſpectiues*: for (as we are there taught) two *Parallels* will in the end ſeeme to concurre ſo far as the ſight can iudge: Now the Spheare of the *Heauens*, and the Sphericall ſegment of the *Waters* being parallell the one to the other, will neceſſarily ſeeme to concurre to the end: whence it muſt needs come to paſſe, that

the

that part of the Sea muſt ſeeme to lift it ſelfe higher, and contrarywiſe the Heauens will ſeeme ſomewhat lower then indeed they are: and this I take to be the true cauſe why the Sea being ſeene a great way off, may appeare raiſed aboue the land whereon we ſtand. Another reaſon may bee giuen from the perpetuall Refraction of the vſuall Lines comming from the Sea to our ſight. For the Aire neere the Sea being alwayes intermixed with thicke watriſh vapours riſing vp, the Sea muſt of neceſſity be preſented in a thicker *Medium* by a refracted ſight: whence cōſequently it muſt ſeeme greater & higher then indeed it is: for as the *Opticks* teach, all things ſeeme greater & higher in a thicker *Medium*. To the other three Reaſons brought to cōfirme this aſſertion it is no hard thing to anſwer. To the firſt which would out of the order of the Elements inforce, that the Water is higher then the Earth; I anſwer (as before) that if we intirely conſider theſe Elements amongſt themſelues, we muſt giue the hight to the Water; for as much as the greateſt part of the Earth lies drowned; for that aboue beares no ſenſible proportion in reſpect of the parts of the Earth vncouered. But here we compare not the 2 Elements intirely betwixt themſelues, but the ſuperficies of the Water with the parts of the Earth vncouered, habitable: which ſuperficies of the earth notwithſtanding, this reaſon, may bee higher then the Water: Secondly, where they produce the teſtimony of the ſight; for my own part, I can warrant no ſuch experience, hauing neuer launced far into the deep: yet if any ſuch experiment be auouched, it may eaſily bee anſwered out of opticall Principles: that comming out of the maine Ocean towards the land, by reaſon of the ſphericall conuexity of the water, interpoſed betweene our ſight, and the lower part of the land, thoſe land parcels muſt needs ſeeme leſſe, as hauing ſome parts ſhadowed from our ſight: whence it muſt conſequently appeare lower, as couched almoſt vnder water. From the 3d reaſon grounded on Scripture, whereon our diuines ſeeme moſt to depend, nothing elſe is concluded, but that Almighty God hath ſet certaine bounds & limits which the Waters ſhould not paſſe: Theſe bounds & limits I take not to be ſupernatural,as if the water reſtrained by ſuch a powerſhould containe it ſelfe,within its own circuit: But naturall as *clifts & hils*,within which,the waters ſeems intrenced. This opinion therefore being diſliked,others haue laboured to defend an oppoſite poſition,that the water is lower then the Earth altogether: which opinion beares more conſtancy with the doctrine of *Ariſt*.& moſt of our modern Philoſophers. The reaſon wheron this aſſertion is grounded,be chiefly theſe: 1 If the ſea were higher then the Earth, what ſhould hinder the water of it frõ flowing abroad,& ouerwhelming the Earth:ſith all men will confeſſe,that the water is by nature diſpoſed to moue downwards to the lower place. If they haue recourſe to ſupernatural bõds,beſides that we haue ſpoken cõcerning the interpretatiõs of ſuch places of Scripture, as ſeeme to fauour this opiniõ; we anſwere as before, that it is very improbable, that God in the firſt creation ſhould impoſe ſuch a perpetuall violence: ſecondly, we read that in the vniuerſall deluge wherein all the world was drowned,God brake open the ſprings of the deep & opened the *Cataracts* of heauen to powre down raine continually many daies together vpon the Earth: Of which there had beene no neceſſity at all; had the ſea beene heaped vp in ſuch ſort as they imagine: For the only withdrawing of that hand and letting goe of that bridle which gaue the water that reſtraint, would haue beene ſufficient to haue ouerwhelmed the whole Earth. The ſecond reaſon is taken from Ilands in the ſea, which are nothing elſe but parts of the land raiſed vp aboue the water. Thirdly we find by experience, that a ſhip carried with the like wind is driuen ſo ſwiftly from the port into the open ſea,as from the ſea into the port, which could not be done if the ſea were higher then the land: for it muſt needs be,that a ſhip if it were to be carried to a higher place, ſhould be moued ſlower then if it came from an higher to a lower. Fourthly all Riuers runne into the ſea from the inner parts of the land which is a moſt euident ſigne, that the land is higher then the ſea; for it is agreeable to the nature of the water, to flow alwaies to the lower place, whence we gather that the ſea ſhore, to which the Water is brought frõ the land, muſt needs be lower; otherwiſe the water in rũning thither, ſhould not deſcend but aſcend. This opinion I hold farr more probable as being backt by reaſon,and the Authority of our beſt Philoſophers : yet not altogether exactly true (as we ſhall ſhew hereafter.) But *Bartholomew Keckermã in* a late German writer holding theſe 2 former oppoſite opiniõs(as it were)in one equall Ballance,labours a reconciliation. In a diuerſe reſpect(ſaith he)it is true that the ſea is higher,and that it is lower then the Earth. It is higher in reſpect of the *ſhores* and *borders*,to which it ſo comes that ſenſibly it ſwells to a Globe or a circumference, and ſo at length in the middle raiſeth vp it ſelfe and obtaines a greater hight then in thoſe parts where in the middle of the ſea it declines towards the ſhore: Of which parts the hight ſuffers ſuch a decreaſe,that by how much neerer the ſhore they ſhall approach, by ſo much the lower they are in reſpect of the ſhore: in ſomuch that touching the ſhore it ſelfe,it is much lower then the Earth. For this opinion our Author pretends a demonſtration: which hee grounds on the 4 chapter of *Ariſtotle de Cælo*, in his ſecond booke, where hee puts downe theſe two poſitions; which he calls *Hypotheſes*, or ſuppoſitions; Firſt that the Water no leſſe concurrs to the making of a Globe or circle, then the Earth: for it ſo deſcends naturally, that it doth ſenſibly gather it ſelfe together, and makes a ſwelling, as wee ſee in ſmall dropps caſt on the ground: Secondly the Water makes a circle which hath the ſame center with the center of the Earth: Out of theſe grounds would our *Keckerman* conclude the water in ſome places to bee higher, in other places to bee lower then the Earth: And hence proceeds he to giue an anſwer to their reaſons who haue affirmed the Earth to bee higher then the ſea: What to thinke of the propoſition or concluſion we will ſhew hereafter, but in the meane ſpace I hold this concluſion not rightly inferred out of theſe premiſes: For firſt whereas he ſayth that the water by nature is apt to gaher it ſelfe round into an orbe or ſpheare, I would demaund whether ſuch a roud body hath the ſame center with the world, or a diuerſe center: he cannot ſay that it hath a diuerſe center, from the center of the Earth: Firſt, becauſe (as we haue demonſtrated in our firſt part) the Earth and the Water haue but one center: and that the Water is concentricall with the Earth: Secondly from the ſecond propoſition or ground of his, out of *Ariſtotle*; if he meanes ſuch a ſphæricity as hath the ſame center with the center of the Earth: I anſwer, firſt that he contradicts himſelfe, becauſe he giues an inſtance in ſmall dropps caſt on the ground, whoſe quantity being ſo ſmall, and conuexity ſenſible, can in no mans iudgment be concentrick to the Earth. Secondly, out of this ground that the Spheare of the water is concentrick to the Earth, hee confutes himſelfe; for according to the principles of *Geometry*, in a Spheare or circle, all the lines drawne from the center to the circumference muſt be equall. Then muſt all places in the circumference or ſuperficies of a ſphericall body be of equall hight from the center, and by conſequence the ſea being ſuch a Sphericall body, cannot haue that inequality which *Keckerman* imagines it to haue: wherefore ſome other demonſtration muſt be ſought for this concluſion. I will goe no further then that I haue ſpoken in the former chapter concerning the figure of the Water: Where I haue probably ſhewed it to be *conicall*; and out of this may be eaſily gathered, how it may be higher then the land in ſome places, as of the middle of greater ſeas, where the head of the Cone is lifted higher; in other, lower; as in the narrow ſtreits where the increaſe of the eminencie is alſo leſſe. The grounds and principles of which we haue laied before.

1 *The ſea in reſpect of the Earth is higher in one place then another.*

Beſides the naturall conformity of the Water to a conicall figure, (as we haue fore-ſhewed) whence one part of the ſuperficies muſt be graunted to be higher then another: wee muſt needs in the ſea acknowledge other accidentall cauſes which produce an inequality in the parts of the ſea: The chiefeſt whereof are the Equality of inclination in all parts of the water to motion: And the inequality of the channells and ſhores: whence it commeth to paſſe that the Water of the ſea being euery where of it ſelfe equally inclined to motion,is notwithſtanding vnequally receiued into channels, ſo that in ſome place,hauing(as it were)a large dominion to inuade, as in the maine Ocean,it falls lower and euener: In ſome other places as ſtreites or narrow ſeas,the water hauing a large entrance from the Ocean, but litle or no paſſage through it, muſt needes ſwell higher, and ſo one place by accident becomes higher or lower then another: Which farther to confirme diuerſe inſtances may be alleaged out of moderne and ancient obſeruations, For diuerſe hiſtories giue teſtimony that ſundry Kings of *Ægipt* by cutting the *Iſthmus* or narrow neck of land lying betwixt the red ſea & the *Mediterranean*, laboured to make *Africk* an *Iland* & open paſſage from one ſea to the other: but afterwards they were perſwaded to deſiſt from their enterpriſe: Some ſay, becauſe they ſaw the red ſea to bee higher then many parts of *Ægipt*, and hereupon feared a generall inundation of all *Ægipt*, if the paſſage were broken open: Others haue deliuered that they feared, that if the paſſage from one vnto another were broke open, and the red ſea hauing a vent that way, the red ſea would become ſo ſhallow that men might wade ouer it, and ſo inſteed of making *Africk* an Iland, it would haue been more ioyned to the Continent then before. Both opinions conſent in this, that the waters of the *red ſea* were by the perpẽdicular found higher then in the *Mediterranean*: Moreouer it is obſerued that the ſea on the weſt part of *America* commonly called *Mare Del Zur*, is much higher then the *Atlantick* Sea which bordereth on the Eaſterne part of it: which gaue way to the coniecture of ſome, that the *Iſthmus* betwixt *Panama* and *Nombre De Dios* had been long ſince cut through to haue made a paſſage into the *Pacifick* Sea, without ſailing ſo farre about by the ſtraits of *Magellane*; had not many inconueniences been feared out of the *inequality* in the hight of the water. The like inequality is obſerued by *Verſtegan* in the ſea betwixt *England* and *France*: For according to his coniecture, *France* and *England* being one Continent heretofore, and ioyned by a narrow neck of land, betwixt *Douer* and *Callais* the water on one ſide was higher then on the other: which he probably collects out of the ſundry flats and ſhallowes at this day appearing on the Eaſt ſide as well on the coaſts of *England* as of *Flanders*, eſpecially between *Douer* and *Callis*, called by ſome, our *Ladies Sands*, about three *Engliſh* miles in length: Out of which and ſundry other probabilities, he labours to proue that all the *Low-countries* were heretofore enueloped with the ſea; till ſuch time as the narrow land being either by *Nature* or *Art* cut through, and the Water allowed a free paſſage, it became *dry land*: but this point wee ſhall diſcuſſe hereafter in place conuenient.

4 In the next place we are to conſider the *termination* of the ſea: The termination is the bounding of the ſea within certain limits.

5 The Limit is the margent or border of land wherein any ſea is circumſcribed.

The ſea is bounded by the land, as the land by the ſea: In reſpect of which termination ſome ſeas are called *Maine ſeas*, others *narrow*, The maine ſeas are foure; to wit, the *Atlantick* which taketh it's name from the mountaine *Atlas*, by which on the weſt ſide it paſſeth, and diuides *Europe* and *Africk* from *America*. 2 The *Æthiopian ſea* running on the weſt ſide of *Æthiopia*. 3 The *Indian* Sea hauing the *Eaſt Indies* on the *North*. 4 *Mare Del Zur* or the *South* ſea, ſituate on the *South ſide* of *America*: Which foure in reſpect of other may be called *Maine Oceans*. The leſſer ſeas are either called *Creekes*, or *ſtreits*; *A Creeke* is a place where the water (as it were) emboſomes it ſelfe into the land, hauing an entrance large from the Ocean, and moſt commonly ſtreytned inwardly, but no paſſage through: A *Creeke* againe may bee diuided into the *greater* or *leſſer*: Vnder the former in a large ſenſe may we comprehend the whole *Mediterranean* ſea: for as much as the ſea from the *Maine Atlantick* Ocean by an inlet is ingulfed into it, but findes no paſſage out any other way, howſoeuer it invades a large territorie. The leſſer Creekes are againe diſtinguiſhed into the *Eaſterne* and *Weſterne*: The chiefe Creekes found out towards the Eaſt are ſixe in number. 1. *Sinus magnus* which lies betwixt *Mangus* and *India extra Gangem* teaching as farre as the region of *Chalcis*. 2. *Sinus Gangeticus* which is comprehended betwixt *Aurea Cherſoneſus*, and *India intra Gangem*. 3. *Sinus Canthi*, commonly called *Canthi-colpus*. 4. *Sinus Perſicus*, bordering on *Perſia*, and called by *Plutarch* the *Babilonian Sea*. 5. *Sinus Arabicus*, which is commonly called the *Red Sea*. 6. *Sinus Barbaricus*, which by *Pliny* is termed *Sinus Trogloditicus* & at this day *Golpho de Melinde*. The Creekes lying Weſtwardly are chiefly theſe; Firſt *Sinus Sarmaticus* lying towards the North, betweene *Denmarke* and *Normay*, which is diuided into *Sinus Sinnicus* and *Bodicus*, which is called commonly the *Baltick Sea* 2 *Sinus Granuicus* diuiding the *Muſcouites* from the *Corelij* Northward; it is commonly called the *White Sea*. 3 *Sinus Mexicanus* bordering on the city of *Mexico* in *America*, amongſt theſe, ſome would number *Mare Pacificum*, or *Mare Del Zur*: but this we thought fitter to call a maine Sea, then a creeke, being extraordinarily large in quantity. A Strait is a narrow Sea between two Lãds; of ſuch Straits theſe were anciẽtly knowne, to wit, 1 *Fretum Graditanum*, or the *Straits of Gibraltar* of 7 Miles diſtance, diuiding *Spaine* from *Barbary* 2 *Fretum Magellannicũ*, found out by *Magellane*, which diuides *America Peruana* from the *Southerne* land, 3 *Fretum Anian*, ſituate betwixt the weſterne ſhores of *America*, & the Eaſterne borders of *Tartary*. Beſides theſe there haue bin diſcouered 3 more, (to wit) 1 *Fretum Dauis*, found out by captaine *Dauis* in the yeare 1586, which lyes toward *Groenland*. 2 *Fretum Naſouicum*. or *Waygate*, neare *Noua Zembla*, diſcouered by the *Hollãders* in the yeare 1614. 3 *Fretum de Mayre* found out by *William Schouten* a *Bauarian*, taking his name from *Iſaac le Mayre*, by whoſe aduice and perſwaſion he vndertook his voyage. But ſome of theſe latter ſtreits here mentioned, for ought I knowe, may better bee reckoned amongſt

Creekes, foraſmuch as they haue not as yet found any paſſage through, though with great loſſe and danger they haue often attempted the Diſcouery. Concerning the bounding of the Sea with the land, we will inſert theſe Theoremes.

1 The Water *is ſo diuided from the* dry land, *that the quantity of Water is greater in the* South *Hemiſpheare, of Land in the* Northerne.

That moſt part of the *dry* land is ſituate towards the *North*, will eaſily appeare by inſtance. For toward the *North* are placed the great Continents of *Europe*, *Aſia*, almoſt all *Africa*, and the greateſt part of *America*: But in the *South* Hemiſpheare, we find only a little part of *Africa* & *America*, beſides the *South Continent*, which we cannot imagine to be ſo great in quantity, as it is painted in our ordinary Mappes: foraſmuch as all places at the firſt diſcouery are commonly deſcribed greater then they are. The reaſon I take to bee this, that the firſt draught is alwaies confuſed and vnperfect, wherin a region diſcouers it ſelfe vnto vs vnder a more ſimple figure, neglecting curioſities; but after a longer and more exact ſearch of any Region, will be found in many places ingulfed with diuers *Bayes*, and variouſly indented; in ſuch ſort, as the bound Line compaſſing it round, making an inordinate figure, and leſſe regular, cannot contain ſo much land as firſt it might ſeeme to promiſe. Moreouer we may further obſerue, that thoſe places which in the firſt diſcouery haue been taken for the maine *Continent*, or at leaſt for ſome greater part of Land, haue afterward vpon more curious examination, been found clouen into many leſſer *Ilands*: As in *America*, *Cuba* in the time of *Columbus*; and *California* of late, thought to be a part of the *Continent*, and ſo deſcribed almoſt in all our Mapps; yet ſince by a *Spaniſh Chart* taken by the *Hollanders*, diſcouered to be an *Iland*. The like inſtance we haue in *Terra del Fuogo*, which ſince the time *Magellan*, was held a part of the *South Continent*, till *Schouten* by ſayling round about it, foūd it diuided frō the main land by *Fretum de Mayre*, carrying the name of the Maſter of the ſhip in his diſcouerie. Neither is it much to be doubted, but that in that large tract delineated out in the Globe for the *South-Indies*, are cōtained many Ilands, diuided one from the other by *ſtreites* and *narrow Seas*, which muſt ſubtract much from the quantity of the dry land; ſo that of neceſſity it muſt be granted, that the *Northerne* Hemiſpheare takes vp the greateſt part of the dry land as the other of the Water. Wherefore that place of *Eſdras* where he ſaith, *That Almighty God allotted ſix parts to the Earth, and the ſeauenth to the Water*; muſt either ſeeme improbable, or ſuffer another interpretation then that of the ancients. For out of credible coniecture drawne from the view of the face of the Terreſtriall Globe, we ſhall hardly collect ſuch a proportion. In this compariſon of the *Northerne Hemiſpheare* with the *Southerne*, we ſhall find a kind of Harmony betwixt the *Heauens* and the *Earth*: For, as Trauailers report, the *Northerne* parts abound with more ſtarres, and of greater magnitude then the other toward the *South*; ſo the Terreſtriall Spheare diſcouers vnto vs more continent, greater Ilands, and of more note, in the North then in the South.

2 *The whole Globe of the Earth is inuironed round from the* Eaſt *and the* weſt *with ſea, diuiding the North from the South.*

To proue this Theoreme we need goe no farther then the famous voyages of *Magellane, Drake, Candiſh*, and *Schouten*; Whereof the firſt attempted, the firſt paſſage through *Fretum Magellanicum*, and gaue it the name, though he could not out-liue his intended iourny. The two next followed the ſame way, and the laſt found out a new paſſage through *Fretum de Mayre*, as we haue formerly mentioned. Whence we may eaſily deduce this *Corollary*, that the *Southerne continent*, not yet perfectly diſcouered, is either *One*, or (which is moſt probable) *many Ilands*: foraſmuch as by ſailing round abont it, they haue found it enery where compaſſed round with Sea. The like may be coniectured of the other parts of the world; on the Northern ſide, whereof we ſhal ſpeak in this next Theorẽ.

3 *It is probable that the Earth is compaſſed round with the water from* North *to* South.

I know nothing which hath exerciſed the witts and induſtrie of the Nauigatours of our age, more then the finding out of a paſſage Northward to *Cathay*, and ſo to the *Eaſt-Indies*, which controuerſie as yet remaines altogether vnanſwered, and awaites the happineſſe of ſome new diſcouery. In which difficult paſſage, wherein many haue ſpent both their liues and hopes, it may ſeeme enough for me to goe with their Relations; ſuffering my coniecture to flye no farther then their ſailes. The reaſons which I meet with in my ſlẽder reading, I will examine as I can, without partiality, and ſo leaue euery man to bee his owne Iudge. Firſt then wee muſt cõſider that the voyage to the *Indies* muſt be effected by either of theſe two waies; to wit, *Northward*, or *Southward*, To beginne with the South, it muſt be performed two waies; either by ſome vnknowne paſſage through the *South-Continent* neare the *Antartick* Pole, or neare the *Magellane-ſtraits*. The former is moſt vncertaine, for want of diſcoueries in thoſe vnknowne and remote parts: and if any ſuch paſſage were found out, it were litle aduantage to our Countreymen, who haue already a ſhorter and nearer way: yet no inſtance can bee giuen to the contrary, but that this part being clouen (as it ſeemes moſt probable) into many leſſer lands, may admit of ſuch a paſſage: But in ſuch vncertainties it is as eaſy to deny as to affirme. The ſecond *South-paſſage* is found out by Nauigatours, which is either by the ſtrait of *Magellane* it ſelfe, or elſe through the *Straights* of *Mayre* before-mentioned, which this Age of ours hath put out of doubt. The third paſſage is *South-eaſt* by the *Cape of good hope*, knowne vnto our *Eaſt-Indian Merchants*, and therefore as a matter vnqueſtioned, needs no further examination. The onely matter which troubles men in this Age, is the finding out of a paſſage *Northward* to *Cathay*, either by the *North-eaſt*, or *North-weſt*; wherein we will conſider two things: 1 Whether it be likely, that any ſuch paſſage ſhould be at all? 2 whether this paſſage ſhould be performed by the North-Eaſt, or North-Weſt. For the former many arguments are vrged which ſeeme to croſſe this opinion, of a way to the *Indies* toward the *North-parts*: For 1 The manifold attempts of the *Engliſh* and *Hollanders*, both towards the *North-Eaſt* and *North-Weſt*, either altogether ſpent in paine or failing of their ends, ſeemes to giue large teſtimonie, if not of abſolute *impoſſibility*, yet at leaſt of the vnlikely-hood of any ſuch diſcouery as is hoped. For what coſt or dangers would not almoſt all the Marriners of our *Northerne* world vndergoe, to find ſo neare a cut to their golden *Indies*? and if by chance many of them miſtooke the right way, yet would it ſeeme improbable, that latter Nauigatours corrected by the former errours, ſhould not after ſo many trialls and attempts, at length hit the marke. This reaſon ſauours of ſome *probability*: yet comparing this with diuerſe matters of the ſame kinde, would ſeeme to be of no great force. For the truth and right being onely one and the ſame, is oppoſed by infinite errours: ſo that it may ſeeme eaſier to commit a thouſand errours, then once to hit the truth: Time and long triall beget many Inuentions, which afterward ſeeme moſt eaſy: inſomuch that many men haue afterward laught at their owne miſtakes. Moreouer, for ought I can find in the Relations of moſt mens diſcoueries, the paſſage which they ſought was too farre Northward towards the Pole; where being infeſted with cold, Ice, and other inconueniences, they were enforced to returne thence againe, hauing ſeldome had any oportunity to winter in thoſe parts for want of victualls, or extremity of cold. A ſecond reaſon againſt this *North-paſſage* may bee drawne from the innumerable ſorts of beaſts wherewith *America* is ſtored: for admitting this paſſage, we muſt needs grant *America* to bee an Iland. Now it is certaine that *Noah's Arke* was the ſtore-houſe and Seminary, not only of mankinde, but of all other perfect liuing Creatures. Againe, it is euident out of the Holy *Scriptures*, that the firſt Region whereon the Arke was deliuered of her burthen, was *Aſia*. Theſe grounds layed, I would demaund how ſuch a multitude of beaſts of all ſorts, ſhould be tranſported from *Aſia* to *America*, being ſuppoſed to bee an *Iland*, and euery where diuided by the Sea from other parts of the Earth could theſe ſilly creatures of their owne accord ſwimme from one ſhore to another? but alaſſe the Sea was too large, and theſe beaſts too fearefull to aduenture on ſuch a voyage. And admit ſome by Nature had bin fitted to ſuch an action, yet were it very ſtrange to imagine the ſame effect of all, being of many kinds. What then? were they tranſported in ſhips? But Nauigation in thoſe daies being an infant, vnfurniſhed of the *Chart* and *Compaſſe*, durſt not aduenture into the *Ocean* ſo farre out of ſight of land. But to giue the oppoſite part all reaſonable aduantage, admit the *Straites* diuiding *Aſia* and *America* were very narrow, and within kenne; was it likely that from hence they could by ſhipps tranſport ſo many kndes of creatures? Could we beleeue any man to be ſo mad, as to carry ouer with him *Lions, Beares, Tigers, Foxes*, and other innumerable ſorts of rauenous and vnprofitable beaſts, as pernicious to mankind, as other creatures ſeruing for his vſe? If any were found ſo fooliſh or malicious, yet were it very vnlikely hee ſhould tranſporte ſo many kinds. This argument ſeemes no more to concerne *America*, then moſt Ilands of the World, wherein we find diuers creatures, not only ſeruing for the vſe of man, but many vnprofitable & hatefull to the Inhabitants: The meanes of this tranſportation is very difficult to finde. St *Auguſtine* with ſome other Diuines haue bin driuen to a ſupernaturall cauſe, as if Almighty God ſhould performe this matter by the miniſtry of Angels, which anſwer we dare not vtterly reiect, being ſupported by the authority of ſo great a Pillar of the church: yet I cannot ſo eaſily imagine, that God who vſed naturall meanes for the preſeruation of all liuing creatures in the Arke, ſhould haue recourſe to a ſupernaturall power in the propagation of theſe creatures on the face of the Earth: wherefore to me the reaſon would ſeeme better anſwered out of our ground which we ſhall proue hereafter.

That Ilands were not from the firſt Creation, but afterward broken from the maine Continent by the violence of the Water: Hence it might come to paſſe, that ſuch beaſts as were in the parts of the Earth ſo broken off, haue ſince there continued by continuall propagation vntill this day; I meane of raveenous and hurtfull beaſts: becauſe of the others leſſe doubt can be made, but that they might be convayed from one Country into another by ſhipping, to ſerue the neceſſity of mankind. Here we ſee that no argument as yet hath bin vrged ſo ſtrong againſt the *North-paſſage*, but may with reaſonable probability be anſwered. It remaines in the ſecond place that we deſcend ſomewhat to particulars, to inquire whether this be to be effected either towards the *North-eaſt* or the *North-weſt*: The *North-eaſt paſſage* hath heretofore bin attempted by many of our *Engliſh* Nauigatours, but with vnhappy ſucceſſe: yet were not theſe voyages altogether fruitleſſe; foraſmuch as by this meanes, a way was found out to *Ruſſia*, whence began the firſt trade betweene ours and the *Ruſſian* Merchants: But that litle hope can hence ariſe, ſundry reaſons may be alleaged, the chiefe whereof are theſe; 1 The dangerous rending of the *Scythick Cape*, ſet by *Ortelius* vnder 80 degrees Northward, together with the perillous ſailing in thoſe Northerne Seas alwayes peſtred with Ice and Snow, ſeconded by diuerſe *Bayes* or *ſhelues*, *miſts*, *fogges*, long and darkſome *nights*, moſt aduerſe to any happy Nauigation, 2 The obſeruation of the Water, which is more ſhallow towards the *Eaſt*, which giues ſmall hope of a through paſſage, becauſe all *Seas* are fed with waters, and for the moſt part are obſerued to be more ſhallow towards the ſhore then in the middle: But where in ſailing forward, any Sea is found to decreaſe in depth; it is a likely argument, that it is rather a *Creeke Bay* or *Riuer*, then a Straite; Notwithſtanding theſe reaſons, ſome haue heretofore gone about to proue a paſſage by the *North-eaſt* to *Cathay*; of which opinion was *Antony Ienkinſon*, whoſe reaſons be well anſwered by S^{r} *Humphrey Gilbert*; which I briefly touch, adding ſome things of mine own, as I find occaſion. The firſt reaſon was drawne from a Relation of *Tartarian*, who reported that in hunting the *Morſe* he ſailed very far towards the *South-eaſt*, wherein he found no end; which might giue a likely coniecture, that it was a paſſage throughout. But to this we may eaſily anſwere, that the *Tartarians* are a barbarous Nation, altogether ignorant of Nauigation, which neither know the vſe of the *Charte*, *Compaſſe*, or Celeſtiall *Obſeruations*; & therefore in a wide Sea know not how to diſtinguiſh the *North-eaſt* from the *South-eaſt*: Beſides the curious ſearch of this long paſſage muſt depend on better Diſcoueries then a poore Fiſher-man, who ſeldome dares aduenture himſelfe out of ſight of land; beſides, the Fiſher-man iudging by ſight, could not ſee about a kenne at ſea, which will proue nothing in regard of ſo long a diſtance, The ſecond Reaſon vrged by M^{r} *Ienkinſon*, was this: that there was an *Vnicorne's* horne found vpon the coaſts of *Tartaria*, which could not come (ſaith he) by any other meanes then with the tide in ſome *ſtreight* in the North-eaſt in the frozen Sea, there being no *Vnicorne* in all *Aſia*, ſauing in *India* and *Cataia*. To this reaſon I may anſwer with S^{t} *Humphrey Gilbert* many waies; 1 We may well doubt whether *Tartarians* knowe a true *Vnicornes* horne, or no: 2 It is credible, that it could bee driuen ſo farre by the Tide, being of ſuch a Nature that it cannot ſwimme. 3 The Tides running to and fro, would haue driuen it as farre backe with the *Ebbe*, as it brought it forward with the *Floud*. 4 the *Horne* which was caſt on this coaſt, might be the Horne of an *Aſinus Indicus*, which hath but one Horne like an *Vnicorne* in his fore-head, whereof there is great plenty in all the *North* parts, as in *Lappia*, *Norvegia*, *Finmarke*, as *Zeigler* teſtifies in his Hiſtory of *Scandia*. 5 Laſtly, there is a fiſh which hath a Horne in his fore-head, called the *Sea Vnicorne*, whereof *Martin Frobiſher* found one on the coaſt of *Newfound-land*, and gaue it to Queene *Elizabeth*, which was ſaid to be put into her wardrope: But whether it be the ſame which is at this day to be ſeene at *Winſor* Caſtle, I cannot tell. The third and ſtrongeſt reaſon which was vrged for the *North-eaſt* paſſage was this: That there was a continuall current through the

Frozen Sea, of ſuch ſwiftneſſe, that if any thing were throwne into the water. it would preſently be caried out of ſight. To this we may eaſily anſwer, that this ſtrong current is not maintained by any Tide cōming from another Sea, but by diuerſe great Riuers falling into this *ſtreight*. In like ſort we find a ſtrong current from *Mæotis Palus*, by *Pontus Euxinus, Sinus Boſphorus*, and along all the coaſt of *Greci* (as *Contarenus* and diuerſe other affirme out of their own experience) and yet the Sea lyeth not open to any other Sea, but is maintained by *Tanais* and diuerſe other riuers: ſo in this *North-eaſt* part may this current of water be maintained by the Riuers *Duina, Ob*, and many others which continually fall into it.

Hitherto haue we treated of other paſſages, either effected or attempted to *Cathay* and the *Eaſt Indies*. The laſt and moſt deſired and ſought in our time, is that by the *North West*. This way hath bin often attempted, as by *Cabot, Dauis, Frobiſher, Hudſon*, Sr *Thomas Button* and others, but as yet not found out. Neither hath it more troubled the induſtry of *Marriners*, then the wit of *Schollers*, which we ſhall find by diſcourſes written of that ſubiect. The abſolute deciſion of this controuerſie we muſt leaue to time: onely ſuch probabilities as I chance to meet with, I wil faithfully ſet down, to giue encouragement to their deſeruing labors, who ſhall farther attempt the ſearch and full diſcouery of this *North-weſt* paſſage. The Reaſons I find vrged, I may well reduce to three Heads: The firſt is drawne from the teſtimonies and opinions of ancient Writers: The ſecond from the Relations and diſcoueries of later Nauigators, from the time of *Henry* the ſeuenth, till our age: The third and laſt from the laſt and neweſt aduentures of men of our time; either lately dead or liuing. To begin with the firſt, we ſhall from the teſtimony of *Plato* in *Timæo*, as alſo in his Dialogue called *Critias*, draw a probable argument: for there he makes relation of an incomparable great Iland, named *Atlantis*, of larger extent then *Europe* and *Aſia*, which was ſituate Weſtward from the ſtreights of *Gibraltar*, and nauigable round about. The Princes of this Iland (according to *Plato's* report) heretofore extended their government ouer a great part of *Europe* and *Africa.* To ſecond which opinion of *Plato*, we ſhall reade in *Marinus Siculus* his Hiſtory of *Spaine*, that in the *American* golden mines, diſcouered by *Columbus*, there haue bin found certain pieces of Coine, ingrauen with the Name and Image of *Auguſtus Cæſer*, which were afterward ſent to the *Pope* by *Iohn Rufus*, *Archbiſhop* of *Conſentium*; whence a probable coniecture ſeemes to be grounded, that *America* in thoſe dayes was both peopled and diſcouered. Now it appeares againe not only by *Plato*, but alſo by the opinion of *Marſilius Ficinus*, *Crantor*, *Proclus*, and *Philo Iudæus* is witneſſed in their learned Commentaries on *Plato*, that this Iland called *Atlantis*, ſome 600 yeares before *Plato's* time, ſuffered an extraordinary inundation, & was ſwallowed vp by water: other like exāples whereof we ſhal produce many, hereafter in place cõuenient: admitting theſe teſtimonies of antiquity, whereof we ought to cheriſh a reuerend eſteem, theſe conſectaries will ſeeme to offer themſelues by way of neceſſary conſequence: 1. That this Iland *Atlantis* was the ſame which afterward from *Americus Veſputius* got the name *America*: becauſe wee find no Iland in the *Atlanticke* Ocean which comes neare that *greatneſſe* and *quantity* aſſigned by *Plato*: 2 that this *Atlantis* or *America*, in thoſe dayes at leaſt was an Iland; becauſe they reported it to bee Nauigable round about. 3 It muſt ſtand with great reaſon & probability, that this land being an *Iland* before *Plato's* time, ſhould be ſo ſtill, if at leaſt it come not nearer to the nature of an *Iland* at this day, then before: For either this Relation of the ouerflowing of this land is true or falſe: If at all it deſerues credit, more reaſon is, that it ſhould be Nauigable round about then before: inſomuch that the Water in this manner ſwelling high, would ſooner fret through and cauſe a paſſage, then make a ſtoppage. 4 This paſſage muſt of neceſſity be toward the *North-weſt* where *America* is diuided from *Aſia* by the ſtreites of *Anian*, which opinion ſeemes better warranted, foraſmuch as we find it ſeconded by the deſcriptions of many Geographers of great name and authority, as *Gemma Friſius*, *Munſter*, *Appian*, *Hunterus*, *Guicciardine*, *Michael Tramaſinus*, *Franciſcus Demongenitus*, *Bernardus Puteanus*, *Andreas Vauaſor*, *Tramontanus*, *Peter Martyr*, and *Ortelius* in his generall Mappe: Who all haue deſcribed *America* as an exact *Iland*, ſetting downe all the coaſts and countryes on the *North-weſt* ſea of *America* from *Hoche-laga* as farre as *Cape Haremantia*; all theſe learned men hauing with one voice deſcribed or reported *America* for an *Iland*; He ſhould ſhew but a ſlender eſteem of *Antiquity*, or ſauour of too much *ſelfe-conceite*, who ſhould offer to contradict. This firſt Argument I confeſſe ſpunne out into ſo many circumſtances, ſeemes at firſt ſight to carry a great ſhew of truth; but vpon ſound examination will be found very defectiue, and vncertaine, carrying more probability in the concluſion, then the premiſes dare to iuſtify: How many *Paralogiſmos* and vncertaine grounds are involved in this reaſon, let my ingenious reader iudge; 1 whether *Plato's* report of this *Atlantis* were a true Relation grounded on experience and obſeruation, or a pleaſant *Fiction* derived from the Poets of that time, wherewith the *Greciã Learning* was much infected; 2 How comes it to be thought probable that *Plato* in thoſe dayes ſhould be ſo exact in delineating out the boundes of this *New-world*, who was ſo ignorant in the *old*, as to thinke *Europe* and *Aſia* to be inferiour in greatneſſe to *America*, which notwithſtanding he thought to be an Iland. 3: How ſhould ſo famous a King as *Atlas*, ſtretching his Monarchie (as the Authors of this reaſon report) from *America* to a great part of *Europe* and *Africk*, in that vaſt gulfe of time, ſlippe away with ſo ſlight a mention: That there was ſuch a Prince as *Atlas*, I make no queſtion; vpon whoſe fame and greatneſſe the Poets grounded that fiction of raiſing vp the vault of heauen with his ſhoulders: But whether this *Atlas* euer ſaw *America*, my reader muſt giue me leaue to make a doubt; The Ignorance of Nauigation in thoſe times, wherein occaſion had not brought to light the *chart & compaſſe*, together with the huge vaſtneſſe of the *Atlantick Ocean*, will ſpeake my Apologie. 4 The finding of *coine* graued with the Image and inſcription of *Auguſtus Cæſar* in the *American mines*, ſeemes to me more ridiculous then all the reſt: We find the acts and conqueſts of *Cæſar* and *Pompey* in *Europe* and *Aſia*, and ſome parts of *Africk* particularly ſet downe by the graue writers of that time: We find *Auguſtus Cæſar*, for ſome petty cōqueſts againſt barbarous people, emblaſoned by the *Poets* of that time to the higheſt pitch of their inuention: we may obſerue the age wherein *Auguſtus* liued to be the floriſh and pride of all the *Romane* learning: and himſelfe the Idoll and ſubiect of moſt of their *Poeticall* flatteries; hauing the happineſſe to be inueſted in the empire, in ſuch a time wherein the *Romane* Monarchie hauing been too much wounded with a ciuill diſſention, was willing to admire her worſt Phyſician: And can any man be ſo ſenſeleſſe to imagine that the diſcouery of the goldē world ſhould paſſe away clouded in ſuch a flattering age, without any mention? could not ſo much as the name be regiſtred to teach poſterity the way to ſo rich an Empire? For my owne part I can aſcribe this, (if the *Hiſtorie* deſerue credit) to nothing elſe but the pride and impoſture of the *Spaniards*, whom we obſerue in all relations to be a moſt ingratefull Nation, who admiring nothing but their owne greatneſſe, haue requited their beſt deſeruing benefactors with diſgrace, and obloquie; ſtriuing to raze out their names and memory to whom they owe the greateſt glory. *Columbus* was a *Florentine* and no *Shaniard*, and therefore muſt not deſerue ſo much of *Spaine* as his *golden Indies*: otherwiſe *Auguſtus Ceſars* image had bin better loſt then found; and the Biſhop receiued ſmall thankes for his *Peraſitick* preſentation, 5: That *America* ſhould euer ſuffer ſuch a *deluge* as to be loſt for ſo large a time, will ſooner bee admitted as a pleaſant diſcourſe in table talke, then purchaſe credit as a likely *Hiſtory*: it ſeemeth to be doubted by *Mercator* a great *Geographer* of latter times, inferiour to none before named, whether euer this tract of lād were ouerwhelmed with Waters in the generall *deluge*; which he was induced to beleeue out of the diſparity of the *Soile*, *Herbes*, *Beaſts*, and *Inhabitants*, with ours, in *Europe* and other parts of the world; This opinion I hold not ſound in Diuinity; yet ſeemes it backt with more ſtrength of humane reaſon, then *Plato's* fable of this imaginary *Atlantick Iland*: Much more could I ſpeake of the vncertainty of this firſt argument, were I not afraid to tire my Reader too much: But this *North-weſt paſſage* is a long voyage, and hath bin for a long time ſought, and therefore I hope ingenious men will pardon my long diſcourſe.

2 The ſecond reaſon is taken from a Relation reported by *Gemma Friſius of three Brothers*, who in ancient time paſſed through this *ſtraite* into *America*: which accident gaue it the name of *Fretum Trium Fratrum*, by which appellation it is knowne at this day. This argument I take to be more weake then the other, as depending on vncertaine report, Indebted I know not to what approued *Hiſtory*: But where *Hiſtory* is vncertaine, reaſonable coniecture muſt challenge precedency: I will heere by way of doubt aske theſe few queſtions; whether theſe three Brothers before mentioned paſſed through this ſtraite or not? If not, no good Argument can hence bee grounded of ſuch a paſſage: or if they paſſed through, I demaund whether they returned to their Country or not, to make a relation: If they returned not, how could ſuch a report with probability be brought home vnto vs? 3 If they returned home: how could ſuch a memorable Action bee forgotten, and not committed to any certaine *Hiſtory*? eſpecially in ſuch a *Monkiſh* age, wherein out of ignorance and want of experience, the moſt petty Inuentions were admired for great matters: The reaſon as yet makes me to ſuſpend my iudgment of Deciſion, till I find better.

3 The third reaſon drawne from *antiquity*, beſt vrged and husbanded by Sr *Humfry Gilbert* for this *North-weſt* paſſage, depends on a certaine Relation of *Indians* in ancient time caſt by tempeſt on the coaſts of *Germany*, *Pliny* relates out of a report of *Cornelius Nepos*, who wrote 57 yeares before CHRIST, that certaine *Indians* were inforced by violence of tempeſt vpon the *Germane* coaſts, which were afterward preſented by the King of *Sueuia*, to *Quintus Metellus*

Celer, then *Proconſul* of *France*, wherevpon *Pliny* inferres in his 2 Booke 66 Chapter, that it is no great wonder, though there be a ſea *North*, where there is ſo much moiſture. To confirme this opinion of *Pliny*, and report of *Cornelius Nepos*, they produce the teſtimony of the excellent Geographer *Dominicus Marius Niger*, who ſheweth how many wayes the *Indian* Sea extendeth it ſelfe, reciting the ſame report of certaine *Indiãs* that were carryed by tempeſt through the *North-ſeas* from *India*, vpon the Borders of *Germany*, as they were following their Trade of Merchandize: The argument grounded vpon theſe Teſtimonies will ſtãd thus: Theſe fore-named *Indians* arriuing on the coaſts of *Germany*, muſt come of neceſſity either by the *South-eaſt*, *South-weſt*; *North-eaſt* or *North-weſt*. The three other coaſts ſeeme altogether improbable, and therefore this opinion of the *North-weſt* ſeemes more worthy credit; firſt, they came not by the *South-eaſt*; becauſe the roughneſſe of the Seas, occaſioned by ſtormie windes, and ſtrange currents in thoſe places about *Cape bona Speranza*, ſeconded by the ſmallneſſe of their *Canoas*, wherein the *Indians* vſually trauailed, ſeem to ſtand againſt ſuch a long voyage: 2 They could not well come a long by the ſhore of *Africk* and ſo paſſe into *Europe*, becauſe the *windes* doe there commonly blow *Eaſterly* off from the ſhore; ſo that the *current* driuing that way would ſooner haue carried them *Weſterly* vpon ſome part of *America*, where they ſhould by all likely coniecture, haue periſhed in that great *Atlanticke* Sea, either in that huge and great *Atlanticke* Sea either by *ſhipwracke*, or want of *prouiſion* in ſo ſmall a veſſell. 3 If they had ouercome all theſe dangers which wiſe men would hardly take vp vpon truſt: It ſeemes hard they ſhould not haue firſt touched vpon the coaſts of the *Azores*, *Portugall*, *Spaine England* or *Ireland*, before they ſhould arriue at the coaſts of *Germany*. 4 For the reaſon before-named they could not come from the *South-weſt*, becauſe the current which commeth from the *Eaſt*, ſtriketh with ſuch violence on the ſtraites of *Magellane*, running with ſuch ſwiftneſſe into the *South-ſea*, or *Mare del Zur*, that a ſhippe without great burden

cannot

cannót without much difficulty arriue at our *Weſterne Ocean*, through that narrow rea : What then ſhall we imagine of an *Indian Canoa* managed by ſuch vnskilfull marriners ? 5. To proue theſe men to be true *Indians*, and neither *Africans* nor *Americans*, ſeemes to be warranted; becauſe the Inhabitants of *Africa* & *America* neither had, nor ſcarce know other kind of Boates then ſuch as beare neither *maſtes*, nor *ſailes*; but ſuch as are are only carried along by the ſhores: except of later times ſuch as haue bin inſtructed by the *Turkes* on the coaſts of *Barbarie*, or by the *Spaniards* in *America*: This argument I confeſſe is wittily ſpunne out by my renowned country-man Sr *Humfry Gilbert*, whoſe ability ſeemes to haue made a harueſt out of the ſtubble. Neuertheleſſe in my conceipt it promiſeth in the concluſion more then the premiſes can well warrant: For firſt it ſeemes not to me a matter ſo cleare out of queſtion whether theſe ſhip-wrackt people caſt in vpon the coaſts of *Germany* were true *Indians*, or not; becauſe ſo farre as my coniecture leadeth me, being grounded on *Hiſtorie*, the name of *Indians* out of the ignorance of thoſe times hath been giuen by the *Romans* to many other forraigne Nations farre diſtant; eſpecially to the *Æthiopiãs* in *Africk* which beſide the teſtimony of diuerſe ancient Hiſtorians, too tedious to relate, may ſeeme probable out of that end of a verſe of *Horace*; *Vltra Garamantas & Jndos*: where for ioyning together two Nations ſo ſeperat in place, the former being in *Africk*, the other almoſt in the fartheſt verge of *Aſia*, he ſeemed as ignorãt of the diſtance, as the people. 2 How ſhould theſe *Weſterne* inhabitants know theſe men to be true *Indians*, whoſe *condition*, *place* and *language* they neuer vnderſtood? 3 Why might not theſe men come from ſome of the *Ilands* in the *Atlantick* Ocean? 4 The reaſon againſt it, drawne from the current ſtriking with ſuch force on the *ſtreits* of *Magellane*, is contradicted by the experience of latter Nauigators : much more I could ſpeake of this reaſon; but that I hold it better to cheriſh a hope of ſuch a paſſage, then by excepting againſt theſe ancient arguments to diſcourage moderne induſtrie.

Other probabilities may ſeeme to be drawne from the diſcoueries of later Nauigatours ſince the raigne of *Henry* the ſeuenth, vnder whoſe protection *Sebaſtian Cabot* vndertook the diſcouery of the *North-Weſt* coſts: In which he preuailed as much as the *Alchimiſts*, who in ſeeking out the *Philoſophers* ſtone haue often miſt of their aime: yet by this meanes inuented many rare and excellent ſecrets, of vſe, and admiration. That *Cabot* the ſame yeere diſcouered as much of the Northerne parts of *America* as *Columbus* of the *Southerne*, out of my ſmall reading ſeemes to mee no great queſtion, whence I cannot imagine that King *Philip* of *Spaine* can in this *New-found-world* challenge a greater intereſt then King *Charles* of great *Brittaine*: a *Prince* of thoſe incomparable vertues, which may be thought worthier to owne, then the others to pretend to ſo great a Soueraignty: For the latter voyages & diſcoueries of *Dauis* & *Frobiſher* (for ought I ſee) they promiſe ſcarce ſo much as *Hope*, which oftentimes flatters and deceiues men with her beſt countenance. But if wee take vp wares vpon truſt, ſome will tell vs of a *Portugall*, who made a voyage through this *Streite Northward*; calling a Promontory within the ſame after his name *Promontorium Corterialis*; of *Scolmus* a *Dane*, who paſſed a great part thereof: but the moſt probable in my coniecture, is that which S^{r} *Humfrey Gilbert* reports of one *Saluaterra* a Gentleman of *Victoria* in *Spaine*, who was ſaid to haue paſſed by chance out of the *Weſt Indies* into *Ireland*, in the yeere of our Lord 1568, who conſtantly auerred the North-weſt paſſage from vs to *Cathay* to bee thought nauigable; and farther related in the preſence of S^{r} *Henry Sidney*, then Lord Deputy of *Ireland* (S^{r} *Humfrey Gilbert* being then preſent) that a Frier of *Mexico* called *Andrew Vrdanetta*, more then eight yeeres before his arriuall, told him that they came from *Mare Del Zur*, through this *Northweſt* ſtraite into *Germany*, and ſhewed *Saluaterra* (being with him at that time in *Mexico*) a *Sea-Chart*, made out of his owne obſeruation in that voyage, wherein ſuch a paſſage was expreſſed; agreeing with *Ortelius* his Mappe: moreouer this Frier told the King of *Portugall* in his returne by that country home-ward, that hauing found ſuch a *North-weſt* paſſage, hee meant ſhortly to make the ſame publicke; but the King earneſtly intreated him not to diſcouer this ſecret to any Nation: for that (ſaid he) *if England had knowledge and experience of it, it would greatly hinder the King of Spaine and me.* This relation I could willingly credit from the mouth of any other man then a Frier; of whoſe palpable lyes, and fabulous inuentions in their flattering letters to the Pope, from both the *Indies*, we haue ſufficient experience. Neuertheleſſe that future ages might not deſpaire of ſo worthy an attempt as the diſcouery of this paſſage, it hath pleaſed God to ſtirre vp the Spirits and induſtry of two later Nauigatours, *Hudſon*, and Sr *Thomas Button*, who haue reuiued the forlorne hopes of the former. For the particulars of whoſe diſcoueries I know not better where to referre my Reader, then to a curious Mappe not long ſince ſet out by our worthy and learned Profeſſour Mr *Brigges*: the arguments I collect from thence are theſe, expreſſed in his own words; 1 In the bottome of *Hudſon Bay*, where he wintred, the hight of the Tide was but two foot, whereas by the neereneſſe of the South ſea in *Port Nelſon*, it was conſtantly 15 foot or more. 2 Moreouer in *Port Nelſon*, where Sr *Thomas Button* did winter, in 57 degrees he found the Tide conſtantly, euery twelue houres, to riſe 15 foot or more: and that a Weſt wind made the *Nepe Tides* equall with the *Spring Tides*; and the Summer following, about the latitude of 60 degrees hee found a ſtrong race a Tide running ſometimes Eaſtward, ſometimes Weſtward. 3 To ſhew the land towards the *South-ſea*, through which we ſeeke to open this paſſage, not to bee ſo far off as our ordinary Charts ſeeme to pretend, may be probably auerred, in that *California* heretofore ſuppoſed to be a part of the *Weſterne Continent*, is ſince by a *Spaniſh* Chart taken by the *Hollanders*, found to bee a great *Iland*; the length of the Weſt ſhore being about 500 leagues from *Cape Mendocin* to the South Cape thereof, called *Cape S. Lucas*; which may appeare both by the *Spaniſh* Charts, and by the report of *Francis Gaule*; whereas in the ordinary Charts it is expreſſed to be 1700 leagues. Theſe Arguments, I confeſſe, haue ſwayde my opinion, but not as yet abſolutely

ſolutely freed me from doubt. Three *Quæries* I muſt leaue for the learned to conſider, and for the time to decide; 1 whether this relation of Mariners concerning the *Bay* of *S^r Thomas Button* and *Hudſon* be true or no? no man will (I ſuppoſe) cenſure me as vnmannerly for asking ſuch a queſtion, conſidering how much many Nauigatours, either by their miſtakes or their induſtrious falſities haue deceiued mens credulities; the one is incident to mankind, which out of vncertaine obſeruations, or vnneceſſary deductions, from thence often drawes an ill conſequence; The other, the ordinary policy of diſcouerers, who leſt their Trauailes might bee thought fruitleſſe, would at leaſt promiſe hope in the reuerſion. How many relations haue been corrected by experience of later Nauigatours, euery one may iudge. 2 Whether this ſtrong Tide in *Hudſons* Bay comming from the *Weſt*, were from the *South-Sea*, or from the *North*, betwixt the Continent and diuerſe Ilands by an Inlet, is not a matter as yet cleerely out of doubt. *Terra Del Fuogo* was heretofore ſuppoſed to bee a *Continent*, till *Schouten* in his diſcouery found it to bee an *Iland*, and a large Sea beyond it toward the *South*. Likewiſe *New-found-land* in all our former Mappes and Globes, expreſſed as a part of the Maine of *America*, is by later experience found to be an *Iland*: and why may not this happen in the other, that at the entrance into *Hudſons Bay*, the land on the right hand ſhould be clouen into many *Ilands*; betwixt which the waters iſſuing, ſhould be turned in ſuch ſort, as it might ſeeme to proceede from the *Weſt*: ſith the Tides taking their beginning from the *Maine Sea*, and continued through ſome Straite, commonly follow the crooked windings of the Channell. 3 That *California* is an *Iland*, it may (for ought I know) be well warranted: But the euidence drawne from the *Spaniſh Chart*, ſeemes rather to cheriſh hope, then perſwade conſent. In this which I haue ſpoken of theſe worthy mens coniectures, I haue rather expreſſed my doubts, then my opinion; eſteeming notwithſtanding that doubt almoſt & *Hereſy*, which ſhould diſcourage any generous and deſeruing ſpirit from a farther attempt of this *North-weſt-Paſſage*.

CHAP. VIII.

Of Sea-Trafficke and Merchandize.

1 OF the *Internall* Affections of the Sea wee haue ſpoken: It remaines now that we treate of the *Externall*: By the Externall I vnderſtand that which belongs to Sea-Trafficke, or Nauigation.

2 Sea-Trafficke is a paſſage by Sea from one Countrey to another.

It is not my purpoſe in this place exactly to ſet downe the Art of *Nauigation*; being a matter requiring a ſpeciall Treatiſe of it ſelfe: yet becauſe ſhipping and Nauigation, as Externall or adiacent Accidents, belong to the Sea as the proper ſubiect; I could not altogether ſlip them ouer without ſome mention: In handling of which matter I onely propoſe to my ſelfe two things: firſt, the *Author* and efficient cauſes of *Sea-uoyages* or Nauigation; Secondly, the *End* and *Vſes* thereof: both which wee will knit vp in theſe two generall Theoremes.

1 *Nauigation firſt taught by Almighty God, was afterward ſeconded by the induſtry of famous Men in all ages.*

The firſt inuention of this excellent art we can aſcribe to no other author then God himſelfe, who firſt taught the *Hebrewes* his choſen people, and not the *Egyptians* and *Phenicians*, as ſome haue falſly imagined: For wee read in *Geneſis* that *Noah* ac-

according to Gods precept, made an *Arke* for the preſeruation of himſelfe and other liuing creatures from the deluge: before which wee cannot learne that there was extant any skill of Nauigation: Of which wee haue many reaſons and coniectures giuen by ancient writers. 1 Becauſe in thoſe times there was greater need of Citties then ſhipps; becauſe citties are not made for ſhipps, but rather ſhipps, for the vſe of citties. 2 Small or little commodity could in thoſe times be reaped from other Countreyes, lying as yet rude and vnpoſſeſſed without Inhabitants. 3 Some would haue this to be a reaſon why God reuealed not this art to the old worldlings: becauſe being ready to periſh in the floud, no man might haue meanes to eſcape or ſaue himſelfe, which without doubt they would haue attempted, had the Art of Nauigation beene knowne amongſt them. Whence it is a probable coniecture, that this knowledge of Nauigation was diſcouered firſt to *Noah* at the time of the *Deluge* whoſe *Arke* reſting afterwards on the mountaines of *Ararat*, gaue a preſident to other Nations neere bordering, in what manner ſhipps were to be framed. Whence it came to paſſe that the firſt to whom this skill was deriued next to the *Hebrewes* were the *Tyrians* and *Phœnicians*, Nations as well for the commodity of the place as Inclination to ſuch buſineſſe more accommodated to Nauigation: For *Tyre* was a chiefe *Mart-towne* of *Phœnicia* bordering vpon the ſea. Which knowledge being deriued from them to other Nations gaue occaſion to *Stratus* and *Strabo* to coniecture that they were the firſt Inuentours of it, being not able through the want of holy writ to aſcend higher. From the *Phœnicians* was this knowledge deriued to the *Ægyptians*, as *Pliny* reports in his 7 Booke and 56 Chapter, when as yet this Art was but rude and altogether vnpoliſhed, as may appeare by the ſame *Pliny*; who teſtifies that they then began to ſaile in a certaine veſſell called *Ratis*: which word howſoeuer it now bee taken generally for any ſhip, was originally interpreted to be made of Beames ioyned together: In which kind of ſhip they are reported to haue paſſed the *Mediterranean* ſea, but eſpecially the *Red-ſea*, being ſet out by

King *Erithra*. Then came this art from the *Egyptians* to the *Grecians* (according to *Pliny* by *Danaus*) who perfected this ſcience, and made a ſhip in a more exact forme then hee had learned amongſt the *Phenicians*: whence *Danaus* was celebrated the firſt Author of this inuention: it being a common errour amongſt all Nations to aſcribe the firſt inuention to him, who was the firſt diſcouerer of it to them, being able to deriue it no farther: Yet the *Grecians* being very full of fabulous inuentions haue found out other Authors of this art; for *Strabo* in his 10 booke, giues it to *Minos*: others, as *Diodorus Siculus* in his 6 booke, to *Neptune*; who is of opinion, that for this cauſe he was afterward tranſlated into the number of the *Gods*. But this is certaine that amongſt all the *Grecians* the *Cretenſians* were the firſt that excelled in this faculty. Whence grew that Prouerbe: *Cretenſis neſcit Pelagus*: as who ſhould ſay nothing could be imagined more abſurd and ridiculous then that a man ſhould be borne in *Creet* and haue no skill in Nauigation: Others aſcribe the firſt knowledge of making ſhips to *Dædalus*, a rare workman in mechanicall occupations: From the *Grecians* afterwards was this trade communicated to the *Italians*, amongſt whom the *Geneuenſians* and *Venetians* moſt excelled. Of the *Venetians* skill in this matter, we read no other argument then their great riches & magnificent power, eſpecially by the ſea, which hath continued vnto this day: whereof no other cauſe can be thought on, next vnto Gods prouidence, then their induſtrie in Sea-voyages. After theſe aroſe the *Portugalls* who vnder the conduct and direction of *Columbus* an Italian, diſcouered *America* called the new-world, and gaue example and excitement to many other Nations to aduenture farther. Amongſt which (by the teſtimony of out-landiſh people) no Nation hath waded farther then the *Engliſh*, who vnder *Drake* and *Candiſh* haue compaſſed about the world and left an eternall Trophie of their immortall fame vnto poſterity. Yet can wee not here defraud the Low-country men of their due commendation, eſpecially the *Hollanders*, *Flemmings*, and *Sealanders*; who by their riches acquired by nauigation and extraordinary power at Sea, haue kept in deſpight of the vſurping *Spaniard* theſe Prouinces, farre richer then at the beginning of their warres, and deſerued that ſaying which was giuen to one of the *Grecians* citties, by the Oracle; *That it was guarded not with ſtones, but with wooden walls.* Thus much may ſuffice for the Authours and firſt Inuentours of Nauigation. Wee are now to ſpeake ſomething of the ends and vſes of it, which may in generall bee referred either to profit or pleaſure: Both which are againe ſpread into many Branches; the moſt of which wee ſhall comprize in this following Theoreme.

2 *Nauigation is very neceſsary as well for the encreaſe of Knowledge as Riches.*

Neceſſity is vſually taken two wayes; either for an abſolute need, without the which a thing cannot bee: or Comparatiuely for a conueniency, without the which a thing cannot well bee: In both ſenſes I may call Nauigation neceſſary for a mans life: for to deferre the later, whereof leſſe doubt is made; it is certaine that many places are ſo poore, barren, and indigent of all ſuccour and reliefe, that they cannot maintaine a populous Nation without forraigne commerce and trafficke; eſpecially in theſe dayes, where the multitude of men is increaſed to ſo great abundance: for the later, many arguments may bee produced to proue the conueniency of Nauigation, which no man of any iudicious inſight can deny to bee moſt ſtrong and forcible. The firſt argument may bee drawne from the Authours and Inuentours of it, whereof wee haue ſpoken in the former propoſition: for firſt (as wee haue ſhewed) it was preſcribed by God himſelfe, who neuer taught mankind any thing idle or vnneceſſary. It was embraced and cheriſhed by many Nations euen till this day, which no doubt had long ſince beene loſt, had not vſe and profit ſeconded the Inuention. Neither is it probable that Almighty God ſhould create that vaſte Maſſe of Water, that it ſhould bee an Element for fiſhes to liue onely, or that (as ſome gueſſe) it ſhould ſomewhat mitigate the extremity and drouth of the Sunnes heat: But that men ſhould by this meanes haue an eaſie and ready way to communicate and trafficke one with the other; which may appeare as well by many Teſtimonies out of the ſacred Scripture, namely *Pſal.* 104 *verſ.* 25. *Eſa.* 26. *ver.* 1, 2. as alſo by the example of King *Salomon*, the wiſeſt of all Kings, who by this meanes got great ſtore of gold from *Ophir* to build the Temple, as will appeare in 1 *Kings* and the 9 Chapter. The ſecond reaſon therefore may bee drawne from the exerciſe of Merchandize, and tranſportation of commodities, which cannot bee adminiſtred without Sea-voyages: firſt becauſe greater ſtore of Merchandize may be carried in a ſhip then in a Cart, Waggon, or any other Inſtrument ordinarily in vſe. Secondly, becauſe in ſhips greater variety of wares may bee brought from diuerſe places, to which a Waggon cannot without great difficulty approach, or not at all. Thirdly, becauſe wares and ſuch commodities cannot ſo quickly bee conuayed in the land from places farre diſtant, as on the ſea: nor with ſo little coſt and charges. The commodities conuayed from one Countrey to another are chiefely three; ſtuffes and other matters neceſſary for apparell, victuals and food, Phyſicall Druggs: all which no man will deny to be moſt profitable for the vſe of mankind. Moreouer it is not to bee imagined that nature produceth ſuch commodities onely for the priuat behoofe of ſome one country wherin they grow. Firſt, becauſe ſuch commodities in ſome countries are found in ſuch abundance, that the ſame place ſeemes not to need them: And nature were vaine, if the vſe were not required. *India mittit Ebur, molles ſua thura Sabæi.* Secondly, becauſe other Nations altogether want ſuch things which abound in other countreyes: without the which notwithſtanding they cannot well liue. A fourth reaſon may bee drawne from the promotion of Religion & ſciences, which cannot well be atcheiued without Sea-voyages or Nauigation. For the former wee need goe no farther then the holy Scripture which giues large teſtimony of ſuch voyages: In the old Teſtament as well as in the new, we haue recommended to all poſterity the induſtrie of the Queen of *Saba*, who is ſaid to haue come from the vttermoſt parts of the Earth to heare the wiſdome of *Salomon*: And how ſhould the Goſpell of Chriſt haue beene diuulged to diuerſe Nations, had not the Apoſtles diſperſed themſelues, and paſſed the Sea in ſhips, to conuay their ſacred meſſage to diuerſe Nations and Kingdomes? neither is it leſſe euident in the propagation of Learning and humane Sciences: Firſt, ont of the example of many and famous worthy Philoſophers, who trauailed far to conuerſe with learned men of other Nations, to enrich their mindes with knowledge. Secondly, out of the firſt propagation of Learning into our parts; which wee ſhall finde (as it were) foot by foot to follow Nauigation. Hence wee ſee that from the *Hebrewes* and *Chaldees* it was deriued to the *Tyrians*; from them to the *Egyptians*; ſo to the *Romans*, and thence to moſt parts of *Europe*. A fourth reaſon may bee taken from the neceſſity of tranſporting *Colonies* into forraine countryes: for as after the vniuerſall *Deluge* of the world, the people dayly encreaſing, were enforced in tract of time to diſperſe themſelues into diuerſe Countreyes: ſo euery Countrey left to it ſelfe, and not much moleſted with famine, or deuoured by warres, will at length grow too populous, vnable to ſuſtaine its owne weight, and relieue its owne Inhabitants. Whence it hath been a policy practiſed by moſt Kings & States in ſuch caſes, to make forrayne expeditions, and ſend forth Colonies into other Countreyes leſſe peopled, to disburden their owne of ſuch encombrances: as we ſee the Kings of *Spaine* to haue ſent many into the *Weſt-Indies*; and we at this day diſcharge many *Idlers* into *Virginia* and the *Barmudas*. Here alſo is the Art of Nauigation vſefull, without which, the Seas could not be paſſed, nor forraine Countreyes knowne. Fiftly, Nauigation ſeemes to bee of greater importance for the defence of a Countrey againſt forraine Nations; becauſe Sea-fights are leſſe dangerous and inconuenient to the Land, then Land-fights. All theſe arguments haue their force and life to proue the profit of this excellent Science. Many arguments may bee drawne to proue the vſe of it for pleaſure and delectation; which being well vſed, hath his place amongſt other of Gods eſpeciall bleſſings. This delight will firſt ſhew it ſelfe in the mutuall commerce and ſociety with other Nations: Sith a man (as *Ariſtotle* affirmes) is by nature inclined to mutuall ſociety, and cannot reape greater pleaſure then in ſuch coniunctions: And as one Man with another findes ſolace; ſo one Nation with another: eſpecially in the variety of ſundry *manners*, *cuſtomes*, *rites*, and *diſpoſitions*. Secondly, in the contemplation of wiſe *Nature*, who hath endowed diuerſe countreyes with diuers *Minerals*, *Plants*, *Beaſts*, and ſuch commodities; then which variety nothing can be more delectable to an ingenious vnderſtanding. To all which we may add as a Corollary, the *Honour* which hath been giuen to Nauigation by Princes and States, as well of former as later yeeres. In ancient times wee read that *Ptolomy Philadelphus*, that learned King of *Egypt*, who furniſhed himſelfe with ſo rich a *Library* 277 yeeres before Chriſts Incarnation, gaue great incouragement to Nauigation, and maintained the paſſage through *Sinus Arabicus*, or the *Red-Sea*, by which the commodities of *India* and *Arabia* were brought to *Alexandria*, and from thence diſperſed through diuerſe places of *Europe*, *Aſia*, and *Africa*. This was afterward ſeconded and cheriſhed by the *Romans*, at which time *Egypt* was made ſubiect to their dominion: But the *Roman* Empire being afterwards rent in pieces by the *Gothes*, *Vandals*, *Lumbards*, and *Saracens*, all trafficke betwixt nations began a while to ceaſe; till ſuch time as the inconuenience being knowne, a new *Mart* was ſet vp at *Capha* in *Taurica Cherſoneſus*, belonging at that time to the *Genois*: Thence was it deriued to *Trebizond*, and afterwards to *Samerchand*, where the *Indian*, *Turkiſh*, & *Perſian* Merchants were wont to trade with the *Venetians*. This *Art* was afterwards ſet vp and reuiued by the *Sultans* of *Egypt*, through the paſſage of the *Red-Sea*, till ſuch time as it was in a manner taken away by the *Portugals*, *Spaniards*, *Engliſh*, and *Dutch*; who haue found out for themſelues a better way by the *Cape of good Hope*, to the *Eaſt Indies*, and by this meanes much abated the Trafficke of *Alexandria*, and the wealth of the *Venetians*. Neither in this Age of ours haue there wanted great Potentates, who haue not onely endowed this *Trade* with great and ample priuiledges; but alſo themſelues practiſed ſuch commerce, as well for the benefit of their Commonwealth,as the increaſe of their particular eſtate. Two memorable examples we haue in *Henry the third, King of England*, and *Laurence de Medices Duke of Florence,* whereof the former gaue many and large priuiledges to all the *Hance Townes* in his Kingdomes, which were in Number about 27: The other himſelfe for his owne priuate commodity exerciſed the Trade of Merchandize: yet was this man moſt ingenious, and a great louer of learned *Men.*

CHAP. IX.

Of Pedography, Riuers, Lakes, and Fountaines in the Earth.

1 WE haue formerly treated of *Hydrographie*, or the deſcription of the Water; now are we (by Gods aſſiſtance) to proceede on to *Pedographie*, which is a deſcription of the *Firme Earth*, or *Dry-Land.*

2 The *Land* is a ſpace contained in the ſuperficies of Earth, diſtinguiſhed from the Water.

The Earth in this place is not taken as in the former part of Geographie for the whole *Terreſtriall Spheare*, compoſed of Earth and Water: Neither yet as it is vſually taken in *Naturall Philoſophy* for an Abſolute *Elementary* body, whoſe cauſes and affections are to bee ſearched out; but *Topographically* for a place or habitable ſpace on the *dry-land*; This *dry-land* diſtinguiſhed from the Water by its Firmeneſſe and Conſtancy, being not ſubiect as the Water to motion and inconſtancy, was therefore (if we belieue the Poet) called *Veſta*, according to that verſe, *Stat vi terra ſuâ, vi ſtando Veſta vocatur.* Neither wants this fable of *Veſta* a ſufficient morall. Firſt, becauſe *Veſta* was faigned to bee a keeper and protectour of their houſes, which may very well agree to the Earth: which not only ſuſtaines and beares vp all buildings and houſes; but alſo affords all commodities and fruits wherewith houſholds are maintained. Secondly, *Veſta* was fained to be the Goddeſſe to whom the firſt fruits were offered in ſacrifice: which may well ſquare with the nature of the Earth, from which all fruits are originally deriued; and therefore (as it were of due) ought all firſt fruits to bee conſecrated to her altar. Two other Parallels betwixt the Goddeſſe *Veſta* are added by *Natalis Comes*: Firſt, becauſe *Plutarch* ſheweth in his *Sympoſiacks*, that the Tables of the Ancients, dedicated to *Veſta*, were made round in forme and faſhion of the Earth: Secondly, becauſe the ſeat of *Veſta* was imagined to bee in the liquid *Aire* immoueable, and not ſubiect to motion: which well agrees with the common conceiued opinion of the Earth. But theſe two rather expreſſe the nature of the whole Terreſtriall Spheare, then of the land diuided from the Waters: This deſcription of the dry-land ſeparated from the Waters, we haue termed *Pedographie*: becauſe the Greeke πέδον, commonly deriued from πȣ̃ς, *a foote*, ſignifies as much as a firme place, whereon men may haue ſure footing, to which is conſonant the Hebrew word ארץ, which ſeemes moſt probably deriued from רצץ, which ſignifies as much as *Terere*, to weare out or waſte: becauſe the Earth is dayly troden and worne with our feet. The proprieties of the Earth appertaining to a *Coſmographer*, are many and various; wherefore to auoid confuſion; wee haue diuided them into theſe heads.

3 The Adiuncts of a Place in the Land are either *Naturall* or *Ciuill*. The Naturall are

ſuch as are inbred in the Earth.

4 The Naturall may bee againe diuided into *Perpetuall*, or *Caſuall*. Perpetuall are ſuch as alwayes, or moſt ordinarily continue the ſame.

5 The Perpetuall proprieties are againe twofold; either *Abſolute*, or *Comparatiue*. The Abſolute I call ſuch as agree to the Land without any reſpect to the Sea.

6 Of the former ſort are ſuch as belong to the Figurature of the Soile, wherin three things are moſt remarkeable: 1 Riuers, Fountaines, and Lakes. 2 Mountaines, Valleyes, and plaines. 3 Woods, and Champian Countreyes.

7 A *Riuer* is a perpetuall courſe of water from a certaine head or fountaine running from an higher to a lower place on the earth.

Riuers are by ſome Geographers more curiouſly diſtinguiſhed into 2 ſorts: whereof the firſt are ſetled or ſtayed Riuers, which ſlide away with a more equall and vniforme courſe: The later are called *Torrents* or ſtickle waters, which are carried with a far greater violence. In a Riuer three things are chiefly remarkeable: Firſt the Fountaine or Spring: ſecondly *Whirle-pooles*: Thirdly the Mouth of it. The ſpring is the place, where at firſt the water ſenſibly breakes out of the

Earth: As *Nilus* in *Africke* is thought to haue his firſt head at the mountaines of the *Moone*. A *Whirlepoole* is a place in a Riuer, where the water falling into a Deep trench, is whirled & teurned round: The Mouth is the place where any Riuer finds a paſſage out, either into the ſea, or into another greater Riuer; which in *latine* is tearmed *oſtium* or a gate: Whence they call *Septem oſtia Nili:* which are ſeuen mouths, by which it fals into the *Mediterranean*. This gaue the name to many Citties and Townes in *England* as *Plimmouth*, *Dartmouth*, *Portſmouth*, *Axmouth*, with many others. Now for as much as all water is by nature heauy, and therefore couets the loweſt place; The courſe of all Riuers muſt needes bee from a higher to a lower place: whence we may gueſſe the hight of lands. For it is neceſſary that for euery mile wherein the water glides forward on the earth, there be made an allowance of 2 foote at leaſt in the decliuity of the ground. For although water will ſlide away at any inequality, yet could not the water bee wholeſome, and retaine any reaſonable ſwiftneſſe of motion without this allowance. Hence we may probably find out the huge hight of the *Alpes* about all the places in *Europe:* becauſe out of them ſpring foure great Riuers, which runne foure wayes; whereof the two greateſt are the *Danow* (which receiues into it 60 Nauigable riuers and ſo diſburthens it ſelfe into the *Euxine Sea* far remote) and the *Rhene*. Of Lakes and Riuers many memorable matters may be ſpoken: all which we will reduce to theſe heads. 1 Their *Generation* and firſt originall: 2 Their *Appearance:* 3 Their *Place* in the earth: 4 Their *Vertues* and effects; all which we will comprehend in theſe Theoremes following.

1 *All Riuers haue their firſt originall from the ſea the mother of Riuers.*

The originall of fountaines and Riuers on the earth is a matter of great difficulty, and for ought I know, not yet found out of our greateſt *Philoſophers*; yet being willing to goe as farre as I can, I will glaunce at probabilities, and firſt ſet downe other mens opinions. Some haue beene of opinion that in the bowels of the earth are hid certaine vaſt concauities and cauernes, which receiuing into them a great quantity of raine-Water, haue giuen originall to *Lakes* and *Fountaines*. Hence they giue the reaſon why theſe fountaines are perpetuall; Becauſe the raine-water receiued into theſe cauernes being extraordinary great, is ſufficient to nouriſh ſuch ſprings of water vntill the next winter; whence comes a new ſupply of more raine. Theſe Riuers (ſay they) in the ſummer decreaſe, and ſometime are dry, becauſe of the defect of water, when the place is not great enough to receiue ſufficient water for the whole yeere. This opinion ſeemeth grounded on theſe reaſons: Firſt, becauſe wee find by experience, that Riuers and fountaines are greater and larger in *Summer* then in *Winter*. Secondly, becauſe where there is leſſe *Raine*, fewer or no Riuers are ſeene: As in the Deſarts of *Ethiopia* and *Africke* few or no Riuers are found: But in *Germany*, *France*, *Brittany*, and *Italy* many Riuers ſhew themſelues; becauſe they abound in the moiſture of the *Aire* and much fall of *Raine*. Thirdly, amongſt vs (wee ſee by experience) in a hot and dry *Summer* they are much decreaſed from their ordinary greatneſſe, or altogether dryed vp; which is a great probability that their originall is from raine. This opinion if it bee onely vnderſtood of ſome Riuers, may be probable; becauſe ſome currents out of doubt take their originall from great ſhowers or ſnowes, as at the foot of the *Alpes* and other ſuch places, where the ſnow daily melts and feeds them: but if it be generally vnderſtood of all Riuers, it is manifeſtly falſe as may appeare by theſe reaſons. Firſt, becauſe the Earth no where drinkes vp the raine farther then ten foot deep in the ſoile; for the higher ſuperficies of the earth is either dry and ſo eaſily drinkes vp and conſumes the Water within that ſpace; or elſe being already moiſt, it receiues it not at all, but expells it by Riuers and channells: Secondly, ſome mountaines not couered with earth, but conſiſting of hard rocke, notwithſtanding ſend forth great ſtore of *ſprings* and *fountaines*, which water could not bee receiued in, through a hard rocky ſubſtance. Thirdly, becauſe in very dry places certaine pits being digged downe into to the ground 2 hundred or three hundred foot deep, will diſcouer many great ſtreames of Water, which could not be from the receite of Raine. Fourthly, it cannot be imagined that ſo much raine could in a winter fall into one place, beſides that which the drouth of the earth conſumes, to nouriſh ſo mighty and great Riuers in the Earth, as are Riuers running in a perpetuall courſe. Fiftly, all Riuers almoſt take their originall from ſome mountaines or other; as *Danubius* from the *Alpes*, and *Nilus* from the mountaines of the *Moone* in *Africke*; Which places being extraordinary high, are more vnapt to receiue water, then lower places of the earth. To the reaſons that they alleadge for their opinions, it is not hard to anſwer: That riuers ſhould be greater in winter thē in the ſummer, the cauſe may be better giuen; Becauſe more moiſture of the Aire falls into the brinke from externall Raine or ſnow in winter then in ſummer; and the ground being moiſter, is able to drinke leſſe then at other times: which is alſo the reaſon why in hotter and dry Countreyes there is not ſuch plenty of Riuers: for we deny not, but fountaines may ſometimes be increaſed and ſometimes diminiſhed by addition of raine-water: but that any ſuch vaſt concauity ſhould be vnder ground, as the receptacle of ſo much raine, and ſhould nouriſh ſo many and ſo great currents. The ſecond opinion is of thoſe who thinke that the originall of all riuers and fountaines is from the Sea: Which conceit hath beene ſtrongly fortified by many Fathers of the Church, and graue Diuines of later time; which opinion is chiefly grounded vpon theſe reaſons: Firſt becauſe it ſeemes a moſt incredible matter, that ſo much vaporous matter ſhould be engendred vnder the earth, to feed ſuch a perpetuall courſe of water: Secondly, if all Riuers ſhould not be deriued from the ſea, no reaſon could bee giuen, why ſo many riuers dayly emptying themſelues into the ſea, the ſea ſhould not encreaſe, but continue in the ſame quantity. Thirdly, to this purpoſe they vrge the place of *Eccleſ.* 1. *All riuers runne into the ſea, and yet the ſea is not full: To the place whence they came they returne, that they may flow againe.* But this opinion ſeemes to bee ſhaken with a great difficulty. For it is a hard matter to conceiue how the water of the ſea being by nature heauy, & lower then the ſuperficies of the earth(as we haue demonſtrated)ſhould aſcend into high mountaines; out of which we find ſprings of water oftentimes to ariſe: for either it muſt aſcend *Naturally* or by *Violence*: not naturally for the foreſaid cauſe;becauſe it is a heauy body : If violently, they muſt aſſigne ſome externall Agent, which enforceth it to this violence. This difficulty diuerſe Authors haue laboured diuerſe waies to ſalue : Some amongſt whom the chiefe was *Theoderet*, haue fled to a ſupernaturall cauſe in Gods providence;as though the water in it's own nature heauy, ſhould be notwithſtanding enforced to the topps of the mountaines; But this opinion ſeemes very improbable ; becauſe,although we cannot deny Gods miraculous and extraordinary working in ſome things;yet all men haue ſuppoſed this to be confin'd within the bounds of nature: And very ſtrange it were to imagine that almighty God in the firſt inſtitution of nature ſhould impoſe a perpetuall violence vpon nature. Others, as *Baſill*, haue thought that the ſea-water was driuen vpwards towards the tops of mountaines by reaſon of certaine ſpirits encloſed in it : *Mare(as he ſaith)fluitans & permeans per cuniculos fiſtularet & anguſtos,mox vbi obliquis aut certe recta in ſublime ſurrectis excurſibus ſe occupatum deprehenderit ab agitante compulſum ſpiritu , ſuperficie terræ vi diſrupta erumpit atq; foras emicat*; The ſame opinion almoſt in euery reſpect is aſcribed to *Plato in Phedone*, and *Pliny 2 booke*.65 chap. *Quo (inquit)ſpiritu, actu & terræ pondere expreſſa ſiphonum modo emicat, tantoq; a periculo decidendi abeſt vt in ſumma quoq; et altiſſima exiliat: Qua ratione manifeſtum eſt, quare tot fluminum quotidiano acceſſu maria non creſcant*. But this expoſition will hardly ſatisfy him who deſires to ſearch farther then obſcurity of words : For firſt by admitting ſpirits as mouers of the waters, they ſeeme to fall into a *Platonick* opinion before examined of vs concerning the *heat* of the *ſea-water*. Secondly, I would demaund whether ſuch ſpirits in the water to which they aſcribe this motion,be *Naturall* Agents or *Supernaturall*, or *Violent*; They cannot be naturall Agents : For

aſmuch

aſmuch as they are ſuppoſed to driue and enforce the water againſt his owne nature. For by nature (as all men know) it is apt to deſcend; whereas here it is ſuppoſed to aſcend by reaſon of ſuch ſpirits. They cannot bee violent agents becauſe they bee perpetuall; whereas no violent thing can be perpetuall. *Thomas Aquinas* being deſirous to ſhew, how much fountaines could aſcend out of the *ſea-water* varies in opinion from the former, and imagines that the *fountaines* and *Riuer-water* is drawne vpwards through the force of *Celeſtiall bodies*, for the common good; to wit that it might water aſwell the *mettalls* in the bowells of the earth, as giue moiſture and nouriſhment to *Plants*, and liuing creatures, dwelling thereon. And this motion (ſaith he) although it be againſt the *particular* nature of the water, is not altogether violent: becauſe elementary bodyes are bound by a certaine law to obey and ſubiect themſelues to the heauenly; ſo that motions impreſſed by them, are not enforced on them by violence. For albeit in ſome ſort it thwart the *phiſicall* diſpoſition; yet haue all creatures an *obedientiall* aptneſſe (as they terme it) to ſubmit themſelues to the ſuperiour. But this opinion of *Thomas Aquinas* (in my conceit) ſeemes leſſe ſound then the former: For firſt *Thomas* had no need at all of theſe ſhifts, holding ſome of his other grounds: For in another place, comparing the hight of the *ſea* and *land* one with the other, he firmely maintaines that the ſea is aboue the land, and that it is bounded and reſtrayned from ouerflowing the dry land, by the immediate power of the Creator: If this be graunted, what need there any aſcent or drawing vp of the water, by any externall power of the heauenly bodyes: ſith the remitting of this reſtraint of waters in ſome places, were ſufficient to cauſe ſuch *ſprings* and *riuers* in the earth: Secondly, his opinion cannot ſtand without manifeſt contradiction of himſelfe; for how can the water, being of his owne nature heauy, be drawne vpward without violence and thwarting of nature. And whereas he alleadges for himſelfe an *obedientiall* aptneſſe in the elementary bodies to obey the ſuperiour, he ſhall find very little helpe to maintaine his part. For this *obedientiall* inclination muſt be either according dingito the nature of the water, or oppoſite vnto it, or at leaſt the one muſt be ſudordinate vnto the other: That it is according to the nature of the water, he himſelfe diſclaimes and experience refutes; becauſe it naturally *deſcends*, not *aſcends:* if it be oppoſite (as indeed it muſt needes be) he contradicts himſelfe: If the *Phyſicall* and *obedientiall* inclination be *ſubordinate* the one to the other; I vrge, that ſubordinate cauſes can produce no other then ſubordinate effects; for aſmuch as the cauſes and the effects are meaſured and proportioned the one by the other. But wee plainly ſee that the motions of aſcent or deſcent are diametrally oppoſed, and contrary the one to the other; ſo that they cannot otherwiſe proceed, then from oppoſite and contrary cauſes. Secondly this obedientiall aptneſſe, is commonly vnderſtood of a creature, in reſpect of his Creator, in whoſe hand it is, as to create all things of nothing, ſo to reduce all things againe into nothing. But this although it be aboue nature, yet no way contradicts nature: and eaſier it is to be imagined, that the *Creator* ſhould annihilate any *Creature*, then letting it remaine in his own Nature, giue it a motion againſt nature: Moreouer if we duly cōſider nature in her courſe, we ſhall find that the *lower* & *elementall* Bodies onely concurre to the conſeruation of the *whole*, and of one another, by following their own priuate inclination: for the whole is nothing elſe then an orderly concent and harmony of all the parts; from whoſe mutuall cooperation, it receiues his perfection; ſo that where any part failes in his owne office, the whole muſt needs ſuſtain dammage. Thirdly, it will hardly be reſolued by any of this opinion, by what meanes or inſtruments the heauenly or ſuperiour Bodies can haue ſuch an operatiue power ouer the water, as to lift it vpward from his owne Center: for neither can this thing be performed by *motion, hight*, or any *Influēce*, which are the three meanes of operation of celeſtiall Bodies on elementary: I will not ſtand to proue every particular in this matter: But onely would haue my aduerſary to anſwere, and giue an inſtance and ſpeciality. Another opinion there is of *Ariſtotle*, followed by all *Peripateticks*, who in his firſt booke of *Meteors*, and 13 Chapter, goes about to proue and maintaine, that all *Springs* and *Wells* in the land are produced and generated in the bowells of the Earth by any vapours reſolued into water: which opinion he labours to ſtrengthen in this manner. It is certain (ſaith he) that the Earth hath within it much aire; becauſe *Nature* will no-where admit a *vacuity*. But the Earth hath not onely many open, but a great many ſecret holes and concauities which cannot otherwiſe be filled then with aire. Moreouer a great part of the Earth, and other vapours therein contained, and ſtirred vp by the force of the Starres, are conuerted into Aire; and that aſwell the Aire included in the bowells of the Earth, as vapours there alſo bred, are perpetually conuerted into water: This reaſon may ſeeme to perſwade, becauſe it followes of neceſſity, that the coldneſſe of the Earth expelling their heat, they ſhould harden & condenſate, & be diſpoſed at laſt to the generation of water: whence alſo the cauſe is giuen of the generation of water in the middle Region of the Aire, although it be not alwaies thence bred: aſwell for other cauſes, as for that the Aire by the heat of the Sunne is ſometimes too hot, and the vapours are too much attenuated and rarified: ſo that the matter of Raine cannot be alwaies ſupplyed. This would *Ariſtotle* haue to bee the originall of all *Springs* and *Fountaines*; So that the water ſhould firſt diſtill as it were drop by drop, out of this vapourous matter: and this moiſt matter ſo collected and drawne together, ſhould afterwards breake forth out of the ground, and ſo cauſe ſuch fountaines. Some reaſons are alſo produced to proue this aſſertion; for (ſay the *Authors* of this opinion) If the Springs and Riuers ſhould proceed from any other cauſe, then they ſhould take their beginning from *Raine-water*, which is before refuted; or from the Sea by certain ſecret paſſages, which opinion ſeemes too weake to endure examination: Firſt, this ſeemes an argument, that the *Sea-water* is commonly *Salt* but the water of *Springs* and *Riuers* is for the moſt *ſweet* and *freſh*; and therefore ſuch Springs are not deriued from the Sea: Secondly, becauſe we neuer find the Sea to be emptied, which muſt needes be, if it ſhould giue beginnings to all ſuch currents of water

in the Earth; Thirdly (we haue already ſhewed) that the *ſuperficies* of the Earth is higher then the Water; ſo that it cannot be conceiued how riuers ſhould be deriued from the Sea. To this opinion, howſoeuer ſeeming probable, and ſupported with the name and authority of ſo great a *Philoſopher*, I dare not wholly aſſent; foraſmuch as it thwarts the Teſtimony of holy *Scripture*, and cannot otherwiſe ſtand with reaſon: becauſe it cannot well be imagined how ſo many vapours, and ſo continually, ſhould be ingendred in the bowels of the earth, to nouriſh ſo many and ſo great currents, as we ſee ſpringing out of the Earth: for a ~~very great~~ quantity or portion of *Aire* being condenſated and made Water, will become but as a little drop: The Aire, according to *Ariſtotles* grounds being by a *Tenne-fold* proportion thinner then the Water. Moreouer the *Aire* in theſe places ſeated in the *ſuperficies* of the Earth, and higher then other places, and by conſequent neerer the Sun, ſhould rather be *rarified* and *thickned*; becauſe heat is the greateſt cauſe of rarefaction, as we ſhall ſhew hereafter: for the reaſons alleaged for theſe opinions, they are drawne only from the weaknes of their aſſertion, which hold that *Fountaines* are deriued either from *Raine water*, or from the *Sea*: both which wee haue examined briefly, and whereof wee ſhall ſpeake hereafter. The Schoole of *Conimbra*, not vtterly reiecting all the former opinions, haue vndertakē to forgoe an opinion (as it were) partaking of all, pretending to ſay ſomething more, when indeed they produce nothing beſides the former. Their aſſertion they haue ſet downe, in eight propoſitions, which I will faithfully ſet downe, and then cenſure. The firſt is that in *ſubterranean* places vnder the ſuperficies of the earth, is hid a great quantity of water, diſtinguiſhed into *Riuers*, *Ponds*, and *Lakes*. This they proue from the daily experiment of ſuch as diggs diuerſe wells and deepe trenches in the Earth; Who many times vnder the Ear[illegible]
find not only many riuers and ponds, but many times ha[illegible]
vpon ſo great abundance of Water, that they can[illegible] ch,
find the bottome or bounds thereof. To this they [illegible] ppen
periment of *Philip* and *Macedon* recorded by [illegible] neither

add an ex-
Aſclepiadorus
who

who cauſed many men expert in digging of mettalls, to be let
downe into an old and forſaken *mine* to ſearch out the veines
of mettalls, to ſee whether the couetouſneſſe of antiquity had
left any thing to poſterity. Theſe men vſing great lights are
ſaid to haue found nothing there, but great and vaſt riuers
and great receptacles of waters. This they alſo labour to confirme
by many and ſuddaine eruptions and breaking out of
waters out of the earth, whereof we ſhall haue occaſion to
ſpeake more hereafter. This firſt poſition, howſoeuer in it
ſelfe true enough, ſeemes litle to the purpoſe; but we will proceed
to the ſecond, which is this: That when God in the
2 third day of the Creation ſeperated the waters into one place,
and hid it in the cauerns and ſecret receptacles of the earth;
at the ſame time diſperſed into diuerſe parts of the earth, a
great quantity of water by diuerſe occult paſſages and channels,
whence comes that great maſſe of waters vnder the
earth; which is before mentioned. This they ſeeme to perſwade
by reaſon; for (ſay they) as the wiſe *Architect* of all for
mans ſake, and the reſt of liuing creatures for the vſe of man,
hath diſcouered the dry land, by reſtrayning all the waters into
one place: ſo it was moſt neceſſary, that he ſhould inwardly
water the earth; by which *ſtones, mettalls, mineralls*, &
other ſuch things in the bowells of the Earth, ſhould in time
grow and increaſe. Alſo that ſome water ſhould from hence
breake vp out of the Earth, for diuerſe cauſes hereafter ſpecified.
Finally as *Philo-Iudæus* affirmes, for the continuation
of the parts of the earth, which otherwiſe might by drouth
be ſeperated and diuided. The third propoſition grounded on
3 the two former is this; That many riuers and fountaines in
diuerſe places by Gods decree ariſe out of the earth, by quantities
of waters hid in the cauernes of the earth, which they
proue by reaſons drawne from the vtility of ſuch fountaines
4 and riuers, ſpringing out of the earth. Fourthly they defend,
that all fountaines and currents were not ſo made and appointed
in the firſt *Creation*; becauſe Hiſtories & experience teach
vs, that many haue broken out of the ground afterwards;
5 whereof we ſhall haue occaſion to ſpeake hereafter. Fiftly
they

they affirme, that if the opinion of *Ariſtotle* be vnderſtood
of all fountaines and flouds, it cannot be approued; for asmuch
as it ſeemes ſufficiently declared in the third opinion,
how ſuch riuers might be generated without ſuch vapours;
as alſo becauſe many arguments and places of *holy Scriptures*,
ſeeme to proue the contrary. As alſo the foure Riuers of *Paradice*
created in the beginning of the world, cannot bee
gueſſed to draw their originall from ſuch vapours, as *Ariſtotle*
imagines; to which accord many ancient *Fathers* vpon
theſe places recited in that opinion, whereas all riuers are
thought to fetch their originall from the ſea. Sixtly for the
credit of their maſter *Ariſtotle*, they are conſtrained to auerre
that although his opinion cannot be verified of all riuers and 6
fountaines of the earth, yet if it be reſtrayned to ſome ſuch
perpetuall currents, it may haue probability, For aſmuch as we
are to beleeue that many ſuch large cauerns and holes are hid
vnder the earth, in which no ſmall quantity of vapours may
be ingẽdred. This probability is greater in thoſe riuers which
are leſſer in quantity then the greater, for the reaſons before
ſhewed. Seuenthly they affirme that it is abſolutely to be beleeued;
that not only great riuers and currents are deriued 7
from ſubterranean waters, which haue originall from the ſea;
but alſo leſſe fountaines and ſprings for the moſt part, challenge
the ſame beginning: whence, they labour to proue by
this reaſon, that in very few places of the earth there is found
ſo perpetuall and apt diſpoſition of vapours vnder the ground
as to nouriſh ſo many and ſo great currents of water. Eightly
(ſay they) it cannot be denied, but that Waters aſwell pro- 8
ceeding from raine, as that which is generated of vapours in
the cauerns of the earth, ſometimes may flow into fountaines
and riuers: What concernes Torrents bred of *raine*, they
haue recourſe to the reaſons of the firſt opinion; for others
they make it alſo probable; becauſe we ſee by experience that
Vapours and *Aire* compaſſed about with earth, are by reaſon
of the cold enuironing it, turned into water, This is indeed
the opinion of thoſe ſubtill *Ieſuits* of *Conimbra*, wherein
although they giue a flouriſh, as if they would defend their

maſter *Ariſtotle*, on whom they comment; yet meane they nothing leſſe; but indeed warily ſticke to the other of the *Diuines* and *ancient Fathers* of the Church, touching the deriuation of all torrents from the ſea, Which opinion, howſoeuer in it ſelfe moſt probable, they know not how to manage and defend againſt oppoſition. For whereas they ſuppoſe that in the firſt ſeparation of the *ſea* from the *dry-land*, a great quantity of water was diſperſed into diuerſe hollow places & cauerns of the earth, from whence Riuers are deriued and made: they haue not in any probable manner expreſſed, how this water ſhould perpetually flow, and feed ſo many & great currents: For firſt, I would aske of theſe learned fathers, whether the water incloſed in the bowells of the earth, whence theſe ſprings are fed, be *higher* or *lower* then the fountaines ariſing out of them. If it be higher; whether the Riuers are continually nouriſhed on the old ſtore, or a new ſupply be daily made. That ſo great riuers ſhould bee maintained ſo many thouſand yeares out of the old prouiſion, is moſt improbable; becauſe the mountaines out of which ſuch ſprings ariſe, cannot be capable of ſo great a concauity: neither can it otherwiſe be imagined, but that many great riuers ſince the beginning, had either bin abſolutely dried vp, or at leaſt diminiſhed in their quantity, their Ciſterns being daily more and more emptied out into their channells. If they graunt that of this water, a freſh ſupply be made; it muſt be either from the *ſea* or from *vapours* in the *earth*. It cannot bee from the *ſea*: becauſe (as wee haue proued before) the *ſea* is lower then the fountaines, where ſprings breake out of the Earth; foraſmuch as we ſee them runne to the ſea from their fountaines, as from a *higher* to a *lower* place. That this ſupply of water in the depth of the earth ſhould bee made by *vapours*, it is alſo improbable in their opinion; who cannot imagine ſo many ingendred in one place, as to feed ſo great currents; as alſo becauſe many riuers were apparant in the firſt *creation*, as the foure great currents of *Paradice*. This obiection hath ſo farre driuen the *Ieſuits* to their ſhifts, as that they haue bin enforced to haue recourſe to the opinion of *Thomas*

Aquinas, who dreames that the waters are enforced vpwards by the influence of the *heauens*, which they a litle before caſt by, and we haue before ſufficienrly refuted. And whereas in the ſubſequent clauſe, they labour to ſalue this place of *Eccleſiaſtes: That all Riuers come from the ſea, and returne thither againe*; They are conſtrained to leaue their old grounds, and runne backe to *Ariſtotle*, who holds that all riuers had their originall from *vapours*, drawne vp by the ſunne; whereof the *ſea* is the chiefe mother. It will bee expected at leaſt that we ſhould diſcloſe our owne opinion, hauing cenſured the former: which we will briefly doe as neere as probability can lead vs, ſubmitting alſo to thoſe which are more iudicious: First therefore, we will ſuppoſe as probable: that the earth is in a manner compaſſed round about with water; for howſoeuer the places more eminent, and ſeparated for our habitation, be dry land, yet not farre vnder the ſuperficies of the earth, whereon we tread, is the earth ſprinkled round with water, for which we may draw an argument; aſwell frõ the *Porous* and *ſpongy* nature of the *Earth*, which is apt to drinke in the water of the *ſea*, in the ſame hight; (becauſe it is the nature of the water, to diffuſe it ſelfe abroad) as alſo from experience of *Minors* and ſuch as digg deepe into the earth, who in moſt parts find water. 2ly, this water ſo enuironing the earth, were it left to it's own naturall ſituation, without an externall Agent, would lift his ſuperficies no higher, then the ſuperficies of the ſea; becauſe being as one with the ſea, it will challenge the ſame *Sphericall* ſuperficies. Now to know how the water thus naturally ſettled, is notwihtſtanding lifted vp higher to become the ſource of Springs, we muſt vnderſtand, that it comes to paſſe not onely by the heat of the *ſunne* and *ſtarres*, piercing farre vnder the ſuperficies of the earth, according to the circle, we haue allotted to the water. But alſo to *ſubterranean fires* hid in the bowells of the earth, in many places: which are cauſed by *ſulphurous* matter ſet on fire by the ſunne, or ſome other accident: whether this *ſulphurous* matter be pure *Brimſtone*, or *Bitumen*, or a mine of *ſea-coale*, as ſome haue thought of our *Bathes* in *England*, I will not curiouſly here diſpute,being of it ſelfe too large a ſubiect for me in this place to handle.This *heat* may be conceiued to concur to the production of fountaines 2 manner of waies: Firſt,by drawing vp diuerſe moiſt *vapours*, which by reaſon of the *thickneſſe* and ſolidity of the earth, being not preſently euaporated out of the ſuperficies of the earth, are enforced to diſperſe themſelues through diuerſe crooked paſſages, where condenſated by cold diſtilling againe into drops of water,they breake out through ſome places of the earth, and ſo become a fountaine. A ſecond way which may alſo ſeeme probable, is that the *Heat* peircing the *Subterranean Water*, though not able to diſſolue much of it into vapours for the ſolidity of the earth,may notwithſtanding through his heat, *Rarifie* and attenuate theſe waters. Theſe waters then rarified, muſt needs ſeeke a greater place, wherein they may be contained: ſith *Rarefaction* is nothing elſe but the extenſion of a body to a greater place then before it occupied. Hence is the Water enforced to enlarge his limits: This enlargement or the place cannot be downeward towards the Center; becauſe all that place was ſuppoſed to be filled vp as farre as the Earth could drinke it. Wherefore it muſt needs extend it's limits *ſidewiſe*, or *vpwards*: By the former of which it may find a paſſage to breake forth on the ſuperficies of the ground: By the latter it may be lifted high enough,to runne from the ſide of a higher mountaine, towards the *Sea-ſhore*. If any man ſhould aske why this *Rarefaction* & ſwelling of the Water is not ſo ſenſible in the open *Ocean*, I anſwere that the ſea is alſo much rarified & lifted vp by reaſon of the ſunnes heate:which whether it be the cauſe of ebbing and flowing of the ſea, in part we haue before diſputed: Secondly that the *ſea-water* ſhould not riſe ſo high as other water vnder the ground, theſe reaſons may be giuen; Firſt that the *Ocean* hath a larger channell to runne abroad on either ſide, and ſo this ſwelling muſt of neceſſity become more inſenſible,whereas the Waters in cauerns & concauities of the Earth, being oftentimes ſtraightly bounded on either ſide, by the narrowneſſe of the channell, muſt of neceſſity take vp the more in hight and eminency. 2

the *Sunne,heauenly bodies* and *ſubterranean fires* worke more ſtrongly and effectually on the open nakednes of the ſea, then on the waters hid vnder the ground, which are more ſhrowded from ſuch an extreame heat. Whence it comes to paſſe, that many parts of the *ſea*, are diſſolued into *vapours*, and ſo conſumed and diſpelled by the ſame; Whereas this heat in the *Subterranean* waters being more moderatly impreſſed; doeth not diſſolue into vapours, and conſume ſo great a quantity of water; but being of a middle temper, rather rarifies it to the vſe forenamed. This ſeemes the more probable, becauſe ſpring water riſing commonly in the ſides of mountaines, is for the moſt part thinner then the Sea-water, as experience dayly warrants, Thirdly the *ſubterranean* vapours are ſooner diſſolued into dropps of water by reaſon of the *cold* they mnſt neceſſarily meete within their paſſage, through the *Earth*; whereas the other from the *Sea* meet with no ſuch encounter till they arriue at the *Middle-Region* of the *Aire*, whence they returne againe in ſhowres of Raine.

2 *All riuers and Fountaines were not from the beginning.*

For the confirmation of this aſſertion, many hiſtories may be produced: It is reported that in *Caria* neere abont the city *Lorus*, there aroſe out of the Earth ſuddenly a great floud of Water, bringing out with it a great quantity of creatures and fiſhes, of which being fatted vnder the Earth, whoſoeuer chanced to eat, dyed preſently. The like is reported, that at the time of the *Mithridatick* warre, at a certaine city of *Phrygia* named *Apamea*, there ſprang vp out of the ground many new *Lakes*, *Fountaines*, *Brookes*; and that one riuer ſprang vp very *ſalt*, which brought vp with it a great quantity of *Oiſters*, and other *Sea-fiſhes*; although the city *Apamea* bee very farre off from the *Sea*. This is reported by *Nicolaus Damaſcene*. Alſo Cardinall *Contarenus* teſtifies in the ſecond booke of Elements, that in a cleare day being in *Valentia* in *Spaine*, there happened a very great *inundation* of water breaking out of the Earth, which being carried towards the City, had well neere turned it into the Sea, had not the gates bin ſhut, and dammes well ordered. Why this ſudden change ſhould ſometimes happen, many reaſons may be produced. The firſt reaſon may be, becauſe of ſome ſudaine ruine or falling downe of ſome parts of the Earth, whereby the courſes of the riuers being one way ſtopped, muſt needs ſeeke out a paſſage ſome other way. This ſometimes happens in great *Earth-quakes*, as we may reade in *Theophraſtus*, that in the mountaine *Coricus*, after an *Earth-quake* many new ſprings and fountaines diſcouered themſelues. Another reaſon not much vnlike the former is giuen from the *Hardnes* of the Earth, which oftentimes ſtopping and hindering the naturall courſe of the water, enforceth it to ſeek a new paſſage. Hence the foreſaid *Theophraſtus* was induced to belieue, that in a City of *Crete* the fountaines were ſtopped vp becauſe the Inhabitants betoke themſelues to another place; ſo that the ſoile was not ſo much ſhooke and moued as before. A third reaſon may be the waſting or cutting downe of great *woods* on the Earth; for it is the nature of the Trees and plants to ſuck to themſelues the Moiſture of the ground into one place. But theſe trees cut downe or remoued, the waters courſe muſt needes be altered.

3 *Many Riuers are for a great ſpace of land ſwallowed vp of the Earth: whereof ſome after a certaine diſtance riſe againe.*

This is confirmed by many Hiſtoricall inſtances, as of the riuer *Timanus* in the prouince of *Aquilia*, of *Eraſenus* in *Argolica*, *Padus* in the *Alpes*; more remarkeable is that of the river *Guadiaua* in *Spaine*: which runneth vnder the ground, for the ſpace of 13 leagues: and neere to a towne called *Villa Horta* breakes vp againe: the like is recorded of *Eurotas* in *Arcadia*, which is ſaid to breake forth of the ground in the Prouince of *Lacedæmon*: So *Cadmus Aſia* is ſwallowed vp in a hole of the ground, not farre from *Laodicea*, So *Piramus* in *Catonia*. *Licus* in *Libanon*, *Orontes* in *Syria*. Other riuers are thought to haue found a ſecret paſſage vnder the ſea from one Region to another: As a riuer hauing his fountaine in the mountaine *Meiates*, which being conuayed in a blind Channell vnder the middle of the ſea, comes forth againe at the port of *Panormus*: ſo others report of *Alpheus*, which being drowned vnder ground nere the *Peloponneſian* ſhore, takes a large iourny vnder the Sea, till it arriue at *Syracuſe*, where it ends in *Arethuſe*; which brings forth (they ſay) ſuch things as are caſt into *Alpheus*: which is much like that which is ſpoken of the Well of *Æſculapius* in *Athens*, wherein if any thing were caſt, they were rendred againe in *Phalericus*: But this laſt I rather hold as a *poeticall* fiction, then a true Hiſtory. Some riuers there are which are not wholly drowned in the earth; but for ſome part; as a part of the *Rhene*, which is hid about foure thouſand paces from the city *Cauba*, and ſhewes it ſelfe again before it come to *Bonna*: in like manner a part of *Danubius* which hides it ſelfe about *Greina* a Towne of *Panonia ſuperior*: ſome riuers there are againe, which are not drunke vp immediatly of the earth, but of certaine great *Lakes* into which they fall as *Iordan* of the Lake *Aſphaltites*: ſome lakes againe hauing ſwallowed vp riuers (as it were) vomit them forth againe, as *Rubreſius* caſts out *Arace* in the Prouince of *Narbon*, and ſo *Lemanus* the riuer *Rhodanus* in the ſame Prouince: alſo in *Italy*, *Lorus* caſt out *Abdua*; *Eupilus*, *Lambre*; *Fucinus*, *Marcia*.

4 *Riuers for the moſt part riſe out of great Mountaines, and at laſt by diuerſe or one Inlet, are diſburthened into the ſea.*

The firſt part of this propoſiton is manifeſt enough out of diuerſe inſtances of the greateſt riuers in the world: for all *Geographers* will giue you to vnderſtand, that the riuer *Indus* in *India* is deriued from the mountaine *Caucaſus*. *Tanais* from the *Riphean* mountaines in *Sarmatia*, *Araxis* from *Panardes* in *Armenia*, *Po* from the *Veſuſian* Hills in *Liguria*, *Danubius* from *Arnobia* in *Germany*, *Exeſus* in *Norico* from the mountaines *Elachia* *Iſara* from the ridge of the *Alpes* toward *France* and *Durias* toward *Italy* from thence. So from the *Herminian* mountaines in *Portugall* are deriued three great Riuers: So *Nilus* in *Africk* from the mountaines of the *Moone*: Theſe riuers thus riſing, are of diuerſe kinds; for ſome haue viſible apparant *ſprings* and fountaines: others are deriued from *Lakes*, out of which they runne. As *Alba* in *Pruſia*, out of *Elbinga*, *Medoarus* & *Oxus* out of two lakes of the ſame names, neere the *Alpes*; *Rindacus* from *Artinia* a poole beſides *Melitopolis*. The reaſon why riuers ſhould be ingendred in mountaines, and ſuch high places, may be giuen; becauſe they are made (as we ſhewed before) by the heat of the ſunne, ſtarres and ſubterranean fires, rarifying aud attenuating the Waters. And this operation of the ſunne in higher places, muſt needes be more effectuall then in lower. Now for the ſecond part, it is plaine to proue, that all riuers runne into the ſea: either making a paſſage from their fountaines, on the land toward the ſea ſhore, as *Nilus* and *Danubius*, with other riuers, or by diſburthening themſelues into greater riuers, wherein they are conuaied into the ſea: as the 60 great Nauigable riuers, which empty themſelues into *Danubius*, or at leaſt are ſwallowed vp of the Earth, and ſo reduced againe to their firſt mother; which we may imagin of the riuers foreſpoken of, drunk vp of the Earth: Although all riuers (as we ſhewed(fall into the ſea yet not all in one & the ſelfeſame faſhion; if we reſpect their paſſage on the lād. For ſome are caried into the ſea by one *oſtiū* or mouth, whereof we haue two notable examples; the firſt of a great riuer in *Braſill* called *Rio de La Plate*, which is caried into the ſea, by a mouth of 40 leagues with ſuch violence, that the Marriners may thence draw freſh water, before they come within ſight of land. The other not much vnlike, is that which runnes by the kingdome of *Congo & Angolo*, which is ſix and thirty thouſand paces broad, where it enters into the ſea, and is caried with ſuch a force, that it ſeuers the waues, & keeps his owne channell, and renders the ſhipp-men freſh water betwixt the ſea waters, for the diſtance of eight hūdred thouſand paces. Other great riuers are diſburthened into the ſea, by diuers *Oſtia* or *Inletts*; as *Rhene* into the *Germane Ocean* by three; *Danubius* into the *Pontick* ſea, by 6; *Indus* into the *Indian ſea* by 7; *Nilus* into the *Mediterranean* by 7 great and famous paſſages: *Volga* into the *Caſpian* lake by 72 gates. Theſe are the moſt remarkeable: others we ſhall ſupply in our *hiſtoricall* part.

5 *Diuerſe fountaines are endowed with diuerſe admirable vertues and operations.*

There is nothing wherein *Nature* delighteth more in miraculous variety, then in fountaines and ſprings of the earth. Of theſe admirable workes of nature, being infinite in theſe ſprings, I will touch ſome. Which the better to effect, I will reduce all to theſe heads: 1 Their *qualities* and operations. 2 their motiõs: For the former we will produce ſome ſew inſtãces. It is reported, that neere the *Garamantes* there is a fountaine ſo cold in the dayes that no man can drinke thereof; ſo *hot* in the nights, that no man can abide to touch it: There is another in *India* wherein a candle will burne. There is alſo another called heretofore the well of *Iupiter Hammon* which in the *morning* is luke-warme: at *noone* cold, in the *euening* Hot, at midnight *boiling hot*; From whence againe it begins to aſſwage till the morning; and ſo (as it were) by turne it growes *hot* and *cold*; a matter of great admiration. Some fountaines in *Liguria* & *Paphlagonia* being drunke will make the head giddy as if he had drunke wine: Another fountaine in *Aranea* a part of *Arcadia* being drunke, will ſo affect the taſt, that who drinks it ſhall neuer afterward endure the taſt of wine; which was very like the fountain *Clitorius* whereof *Ouid* in his Metamorphoſis the laſt booke ſings, in this manner:

Clitorio quicunq; ſitim de fonte leuârit,
Vina fugit, gaudetq; meris abſtemius vndis.

The ancients haue alſo recorded, that in *Bœotia* neere the riuer *Orchomenon*, are two fountaines; whereof the one gets *memory*, the other cauſeth *obliuion*. There is in the Iland *Cea* a fountaine making the ſenſes dull; another in *Æthiopia*, whereon the Water drunken will make a man mad: Some water abſolutely kils him which drinkes, as the riuer *Styx* in *Arcadia*, being a venemous fretting poiſon, and therefore by the poets fained to be one of the riuers in Hell. Diuers other riuers are profitable to cure diuers diſeaſes of the body, whereof I need not bring any inſtances; becauſe ſuch new-found wells are ſometimes diſcouered amongſt vs here at home. There are 2 riuers in *Bœotia* of admirable vertue, whereof the former, if a ſheep drinke of it, he will become *yellow*: but if a *ſheep* of a dunne or *yellow* colour drinke of the other, he wil become white: Riuers which make ſheep white coloured beſides, are *Neleus* in *Eubœa, Aliacmon* in *Macedonia: Crathris* in *Thurijs*: ſo *Cerius* in *Eubœa, Auxius in Macedonia, Peneas* in *Theſſaly*, will make them *blacke: Clytumnus* will cauſe *whiteneſſe* in *oxen*: So the riuer *Aſtaces* in *Pontus* waters the land, whereby *mares* haue their *milke blacke*. Amongſt the regions of the *Troglodites*, there is a well which thrice a day will become *ſweet* and *bitter*, and againe returne to his former ſweetneſſe: and ſo often againe in the night. This may ſuffice to ſhew the variety of operations in theſe wells, in reſpect of other creatures. No leſſe admirable variety is diſcouered in obſeruing of their diuerſe motions. For ſome riuers ouerflowe their bankes at ſome certaine times of the yeare, as *Nilus* in *Egypt, Euphrates* in *Meſopotania*, *Indus* in *India*: ſome fountaines are carried with ſuch violence, that they caſt vp ſtones, as *Marſia* in *Phrygia*, and expell any weight as a certaine one in *Arabia*, whereof the like was recorded to be in *Portugall*: ſome will ſwallow vp any thing throwne into them, as one in *Portugall*, if we beleeue *Pliny*: ſome others although they are *cold*, will ſeeth and ſeeme to boile as the water on the fire; yet neuer caſt out their water beyond their bankes, but ſtraight-way ſwallow it vp againe, as *Acidula* in *Albogano*, and another fountaine in *Cappidocia* named *Tiana*: ſome there are which ſometimes riſe and ſwell, and other times fall againe of their owne accord, as *Crater* of *Turinge*, and a fountaine in *Italy* called *Pluiaua*: ſome wells imitate the *ebbing* and *flowing* of the *ſea* in all *encreaſes* and diminutions, as one in *Cales*, and the other neare *Burdeaux* in *France*: ſome are contrariwiſe affected to the ebbing & flowing of the ſea, flowing when the ſea *ebbs*, and *ebbing* when the ſea flowes as certaine *Pits* in *Spaine:* ſome encreaſe and diminiſh without any conſent or agreement with the motion of the ſea;as a Well in *Tenodus*,an Iland neere *Troy*. In *Cantabria* are three fountaines , diſtant 8 foot the one from the other,and falling into one Channell in a vaſt riuer, which euery day are dry twelue times,and ſometimes twenty times: others of their own accord purge & cleanſe themſelues,caſting out wood, clay, durt,and other matters wherewith they are defiled, as a Well in the *Cherſoneſus* of *Rhodes*.Theſe and many more remarkeable inſtances haue our naturall Hiſtorians gathered together , whereof though ſome perhaps may bee thought to be forged of *Poets* for pleaſure , or miſtaken for want of good diſcouery and obſeruation ; yet muſt wee not wrong *Antiquity* ſo much as to reiect all , hauing in this ſubiect enough to wonder at in ourowne Country.

6 *Places neare great Riuers and Lakes are moſt commodious for habitation.*

It hath bin the cuſtome of all times and nations almoſt in the world,to chooſe out for a choice place for building of cities,their habitation neere ſome great *Lake*,*Riuer*,or *Arme* of the Sea;which ſprang from the common obſeruation of Men, who found ſuch places to be more conuenient. This conueniency is ſhewed many wayes : firſt , becauſe by meanes of ſuch water they haue quick *paſſage* and *trafficke* with other Nations,being able with more eaſe both to receiue, & to ſend forth wares and merchandize.Whence we ſee that ſuch *cities* as are ſeated vpon the water , are commonly of all other the *richeſt* : whereof we may giue an inſtance almoſt in euery countrey,as of *Seuill* and *Liſbone* in *Spaine* & *Portugall*:of all the Cities almoſt of the *Low-countries* ; of *Paris* in *France*: whence(no doubt) grew that Engliſh Prouerbe ; *That the Sea is a goood neighbour* ; which may aſwell be vnderſtood of any nauigable Riuer. Secondly ſuch a ſite is moſt conuenient for the *purging* away of all *filth* and *excrements* , which could not with the like conueniency bee ſo ſoone tranſported by land : whence many men haue laboured to tranſport riuers far remote vnto Cities. Thirdly, becauſe ſuch riuers and watry lakes yeeld ſtore of *fiſh*, whereby the Inhabitants may be nouriſhed, and other creatures the better preſerued: Fourthly, no ſmall commodity would accrew to a Cyty by water neare adioyning If it ſhould chance (as often it doth) to be ſet on *fire*; for hauing water neare it, it may ſoone be quenched: whereas many little ſprings cannot afford ſo much water as would ſuffice for ſuch a purpoſe. Laſtly, amongſt other reaſons wee cannot forget the pleaſantnes of faire riuers, which are no ſmall ornaments to a City, and delights to the eye of the Inhabitants.

8 Thus much for riuers: A Lake is a collection of perpetuall waters, nouriſhed with freſh ſprings, and hauing of it ſelfe no paſſage forth.

In this definition of a Lake, wee haue comprized theſe three things: Firſt that it is a collection of conſtant and perpetuall waters: Secondly, that it is continually fed & cheriſhed with freſh ſprings, riſing vp from the bottome. Thirdly, that it finds no paſſage forth into the ſea or otherwiſe. By the two firſt it is diſtinguiſhed from a great *Pond* or ſtanding poole called in Latin *Stagnum*: For aſmuch as a ſtanding *poole*, being commonly fed with raine water, and hauing no ſprings from the Earth whereby it may bee long nouriſhed, is often times by the heat of the ſunne exhauſting it out by vapours, either extraordinarily diminiſhed, or altogether dried vp: Whereas in a Lake by reaſon of freſh ſprings, the Water is perpetuall and remaineth ſweet and holſome, except by ſome other accidents, it change it's diſpoſition. For the latter clauſe that a lake finds no paſſage forth, it may bee two waies vnderſtood: either of a *viſible* or apparant paſſage outwardly through the ſuperficies of the Earth to the ſea, or of a *ſecret* and ſubterranean paſſage vnder ground: The former may againe be vnderſtood of a paſſage forth immediatly by it ſelfe, or mediatly by ſome riuer: whereas wee haue ſaid that it finds no entrance into the ſea, we ought to vnderſtand it, that immediately it is not to be accompted a continuate part conioyned with the ſea: neuertheleſſe it may be diſburthened into the ſea by ſome riuers running out of it, as ſome would haue the great riuer *Tanais* not to haue his head or fountaine in the *Riphæan* mountains, as the ancients haue taught, but in a certaine *Lake* not farre from the city *Tulla*: ſo *Volga* & *Edill* draw their originall from a lake not farre from *Moſcow*: with many others of like nature. What to thinke of the *ſubterranean* intercourſe betwixt *Lakes* and the *ſea*, wee will ſhew in this Theoreme.

1 *It is probable, that moſt Lakes haue ſome ſecret intercourſe with the ſea vnder ground.*

For the confirmation of this point, there want not reaſons: The firſt reaſon may be drawne from the quantity of Water in moſt Lakes, which is found without any great ſenſible difference to remaine the ſame, without any diminution or encreaſe; whereas if the water bound in with theſe limits, ſhould haue no paſſage out any way, it ſhould encreaſe to ſuch greatnes, that it would eaſily ouerwhelme the bankes To giue a few inſtances, we find that diuerſe very vaſt riuers exhauſt themſelues into the *Caſpian* Lake as *Volga* and *Edill*, which receiuing into them many notable riuers, are at laſt themſelues ſwallowed vp in the ſaid lake: In like manner the Lake of *Paleſtine* called the dead ſea, is known to receiue into it beſides diuerſe leſſer riuers, the great and famous riuer *Iordan*. Heere would I demaund, whether theſe great riuers perpetually caſting themſelues into a Lake, giue an encreaſe to the former quantity or not: if they ſhould augment the water, they would by conſequence alter the bounds: But this is contradicted by experience. If the quantity of the water ſuffers no encreaſe, it muſt needs follow then, that the water ſhould ſome other way be diminiſhed, as it is heere encreaſed. This muſt either be by the ſunne drawing vp ſome parts of it by vapours, or by ſome cauerns of the Earth, drinking vp ſome parts of it: Or laſtly by a ſubterranean paſſage into

the

the ſea: Concerning the former it cannot bee denied, but much Water is drawne vp into *vapours* by the heat of the *ſun*, yet that theſe vapours counteruaile the water perpetually brought in, is in my conceit very improbable: for againſt this quantity of water extracted out this way of *evaporation*, I will oppoſe theſe three things which ſhal perſwade a reaſonable man, that the water receiued in, ſhall farre ſurpaſſe the vapours exhaled from it: Firſt that the vapours are ſtirred vp in the day time, when the ſunne is lifted aboue the *Horizon*, at ſuch a height that his heat is ſomewhat ſtrengthned, wheras all theſe watry currents neuer intermitting their vſuall courſe, neuer ceaſe to runne by *day* or *night*: wherein is ſeen a double aduantage of the riuers, in reſpect of the watry exhalation: Secondly of theſe watry vapours, ſo drawne out, a great part muſt at diuerſe times returne back, or at leaſt ſo much otherwiſe by *rayny* ſhowres, dropped downe into this *Lake*. Thirdly, theſe watry parts thus rarified and attenuated in vapour ſhould (putting this ſuppoſition) in equality, diffuſe themſelues abroad in ſuch extraordinary manner, that all the Regions round about ſhould in all likely-hood ſuffer a great inconueniency of foggy exhalations. On the other ſide it is very vnlikely, that it ſhould bee receiued into empty caverns of the Earth, without paſſage into the ſea, or ſome great riuer, disburthening it ſelfe thereunto. For I would demaund whether theſe cauerns were euer filled with water or not? if they haue been filled, how could they receiue more water, ſith the filling of any place ſuppoſeth it to be firſt empty. That they were neuer yet filled with Water, is farre more vnreaſonable: that any man ſhould imagine, any cauerne of the Earth to bee ſo vaſt, with ſo great currents of Water perpetually running in almoſt ſix thouſand yeares, ſhould not repleniſh: eſpecially conſidering the bowells of the Earth, not farre from the vpper face, to be every where ſpread with Water round, which might alſo helpe to this purpoſe: Wherefore it cannot well bee imagined but that euery ſuch great lake, hath ſome vent or paſſage vnto the ſea, either by ſome *ſecret* & ſubterranean channell, or at leaſt by ſome great *riuer* iſſuing out of it, and ſo running into the Ocean. Another reaſon may be taken from the currents of ſome ſeas, which are by good reaſon aſcribed to this cauſe: For it is obſerued by skilfull Nauigatours, that the Water is carried by a very ſtiffe courſe from *Propontis* and the *black* ſea into the *Ægean*, and from thence into the *Mediterranean*: The originall of which current may with good coniecture be found out in the *Caſpian*, which by ſome ſecret *paſſage* vnder ground, diſburthening it ſelfe into the *black* ſea, cauſeth it to enforce his owne waters farther of, for the receit of the other. Thirdly that theſe ſubterranean paſſages are not vnlikely, may be confirmed by many riuers which are ſwallowed vp, ſome wholly, ſome for ſome place only of the Earth, whereof we haue ſpoken before. Alſo it may ſeeme likely by the Water, ſpread round about the Earth, which through the bowells of it find a paſſage from the ſea, bearing as it ſeemes the ſame leuell. This may (for ought wee know) be the originall of all *Lakes*, and this alſo may bee a way or meanes, whereby they empty and disburthen themſelues being ouercharged with too much Water.

CHAP. X.

Of Mountaines, Valleyes, Plaine Regions, Woods, and Champian Countryes.

1 THe ſecond variation in the figurature of the Earth is expreſſed in *Mountaines*, *Valleyes*, and *Plaine* Countreyes. A Mountaine is a quantity of Earth heaped aboue the ordinary height

of the land. A Valley is the depth of the Earth between two Mountaines. A plain is a ſpace of Earth where there is found no notable riſing or falling of the ground.

The diſtinction of the Earth according to it's externall figurature into *Mountaines*, *Valleyes*, and *Plaines* is very naturall; becauſe euery ſpace or parcell of land in reſpect of the places neere or about it, muſt either riſe higher, or fall lower, or at leaſt muſt beare an equality; where the former is admitted, there muſt needs be *Mountaines* ſwelling higher then the ordinary leuell of the Earth; where the ſecond is found, the ground is indented with *Valleyes* and *concauities*: where the third is to be ſeene, there muſt be Plaines. Here is to be noted that howſoeuer *Plaines* abſolutely conſidered, haue a ſphericall ſurface for the moſt part, eſpecially, if the *Plaines* be large, becauſe they concurre as circular ſegments to make vp the *Spheare* of the Earth; yet they may be called *Plaines*, becauſe they ſo appeare to our ſenſe, which in ſo ſhort a diſtance, cannot perceiue the *Sphericall* figurature of the Earth; Some *Gramarians* here curiouſly diſtinguiſh betweene *mons* or a *Mountaine*, and *Collis* or a *Hillock*, which is a little hill: & alſo betwixt *Vallis*, which they would haue to be a low parcell of ground betwixt two mountaines, and *Conuallis* which is a lower ſpace, only bounded on one part by a *mountaine*; which *Varro* would haue to bee deriued from *Cauata vallis*; but theſe *Grammatical* ſcruples are of ſmall vſe to ſuch as ſpend themſelues on greater matters: becauſe the ordinary & vſual manner of ſpeech (euen amongſt the vulgar) will ſhut out all miſtakes in this kind; what deſerues the ſtudy of a *Topographer* concerning this, ſhall be expreſſed in theſe *Theoremes*.

1 Mountaines, Valleyes, *and* Plaines were *created in the Earth from the beginning, and few made by the violence of the Deluge.*

It hath bin the opinion of ſome, aſwell *Diuines* as *Philoſophers*, that the violence of the *Deluge* hath extraordinarily altered & defaced the Earth, being the chiefe cauſe of *Mountaines & Valleyes* therein: but this opinion is contradicted by many reaſons; firſt out of the Text it ſelfe of *Geneſis*, where it is ſaid, that the water of the flood ouer-flowed by 15 Cubits the higheſt Mountaines: to which may be added the Teſtimony of *Damaſcenus*, who reports, that in the time of the Deluge, many reſorted to a high mountaine of *Armenia*, called *Baris*, where they ſaued themſelues which laſt clauſe although it expreſly contradicts the holy *Scriptures*, which ſpeake but of Eight Perſons that were ſaued: yet it is a ſufficient teſtimony to proue that ſuch Mountaines were before the Flood, and therefore not made by it: Secondly had there followed ſo great an alteration of the Earth, to cauſe *mountaines* as ſome imagine, then ſhould not the ſame places after the flood retain their names, bounds, and deſcriptions, which they did before the flood; the contrary whereof we find, in that *Moſes* writing of *Paradice*, & other places, about 850 yeares after the flood, was moſt exact in ſetting downe the *Names, Limits*, and whole deſcription of them, as though they had remained to be ſeene in his dayes. Thirdly, had the violence of the waters beene ſo great as to raiſe vp mountaines in the Earth, it would without doubt haue bin forceable enough to haue turned *Riuers*, and haue changed them from one place to another, caſt downe and demoliſhed the greateſt Cities and buildings, throwne downe and ouer-whelmed all plants and vegetalls on the Earth, and (as it were) haue buried from all ſucceeding time, the memories of the former ages, ſo that little or nothing ſhould appeare: but this may bee proued otherwiſe by ſundry Inſtances: Firſt that the *Riuers* haue ſtill remained the ſame, may appeare out of the place alleaged of *Geneſis*, where *Moſes* ſpeaking of the ſite of *Paradice*, ſets downe all the riuers of it exactly, eſpecially *Tigris & Euphrates*: out of the which we may eaſily gather in what *longitude* and *latitude* it ſtood: had any thing bin altered in the courſe of the riuers, it is likely *Moſes* would haue ſpecified

fied it in this *Hiſtorie*, that after ages looking for theſe places, might not miſtake or ſuſpect the truth of his Relations: Secondly, that it hath not extinguiſhed all *Buildings*, and ancient monuments of the fathers before the flood, may probably be coniectured by the teſtimony of *Ioſephus* a writer of good credit, who affirmeth that he ſaw one of the pillars, erected by *Seth*, the ſecond from *Adam*; which pillars were ſet vp aboue 1426 yeares before the flood, accompting *Seth* to bee a hundred yeares old at the erection of them, and *Ioſephus* himſelfe to haue liued ſome 40 or 50 yeares after *Chriſt*; Now although we are not bound to credit all thar he relates; yet may we truſt him concerning ſuch matters as happened in his time; aud that this pillar was ſet vp by *Seth* was neuer yet called in queſtion, but warranted by *antiquity*: the like is recorded by *Beroſus* of the Citty of *Enoch*, that it was not demoliſhed by the flood, but remained many yeares after, the ruines whereof as *Annius* in his commentary reports, were to be ſeene in his time, who liued in the time of *Ferdinand* and *Iſabella* of *Caſtile*. It is alſo reported by *Pomponius Mela*, that the Citty of *Ioppa* was built before the flood, of which *Cepha* was King, whoſe name with his brother *Phineus* together with the grounds and principles of their religion, were found grauen vpon Altars of ſtone: All which are ſufficient to proue the violence of the Waters, not to haue bin ſo great to demoliſh all *mountaines* and *monuments*; Moreouer it may be plainly proued out of the text, that the Waters ſuffered the plants and trees of the Earth to grow, and remaine as they did before; becauſe it is ſaid, that when *Noah* the ſecond time ſent out the *Doue*, ſhe returned with an *oliue* branch in her mouth, which no doubt ſhe had plucked from the trees, after the trees were vncouered; for otherwiſe ſhe might the firſt time haue found it floating on the Waters: a manifeſt proof that the trees were not torne vp by the roots, or turned topſy turuy, but remained fixed in the Earth as they did before. Fourthly, had the water ſuffered this extreame violent motion, as whereby it might make many mountaines, I aske whence this motion ſhould come? it could not bee from the naturall motion of the water, which is to moue downward: for what deſcent of waters can bee in a *Sphericall* round body, where no part is higher, or lower? That there was any wind to driue and enrage the Waters, is very vnlikely; becauſe it is ſaid, that God cauſed a wind to paſſe vpon the Earth, and the Waters ceaſed; ſo that there was no wind till the Waters ſanke: Laſtly, wee may argue from a *finall cauſe*, that this inequality in the ſuperficies of the Earth was before the flood; becauſe it is certaine that all things were in as good or better eſtate, then now with vs, and that the Earth was adorned with all varieties of creatures as well for *profit*, as *delectation*. Now it is found by experience, that all commodities agree not to all places, but ſome are found in the mountaines, at all ſorts of *mettalls* & *mineralls*, *Plants*, & *Vegetalls* for the moſt part proſper beſt in the *vallies* and *plaines*: Alſo that the mountaines ſerue for a ſhelter to guard the vallies from the rigor of *cold* and *wind*, both for the better conueniencie of mans life, and encreaſe of fruits for the vſe of man: Whence we may conclude, that it is farre more probable, that the great *Mountaines* were ſo created in the beginning, and not made by the flood; yet can wee not deny, but that ſome ſmall *Hillockes* might be made by the flood, and afterward by the induſtrie of man, which haue raiſed great *fortreſſes*, and bulworks, which afterward decaied, were made great heaps of Earth (as we ſee many in this land) but this is of ſmall note & not worthy conſideration, in compariſon of the great mountaines of the Earth whereof we eſpecially treat.

2 *The perpendicular height of the higheſt mountaines ſeldome exceeds 10 furlong.*

This propoſition depends on the authority of *Eratoſthenes* a famous *Mathematician*, who being employed by his King, found out by *Dioptrick* Inſtruments the height of the higheſt mountaines, not to exceed the quantity aboue ſpecified. *Cleomedes* extends this a little farther, and would haue ſome mountaines to attaine the height of 15 furlongs, of which height he would haue an high rock in *Bactriana* called by

Strabo 11 *libro Siſimitræ Petra*; But yet if we credit *Pliny* on *Dicæarchus* who meaſured the Mountain *Pelion* accõpted the higheſt,he found it not to exceed 1250 paces which make 10 *furlongs*:and *Solinus* relates the mountaines of *Theſſaly* to be higher then elſe-where are to bee found. But this opinion howſoeuer ſupported by the authority of the ancient and famous *Mathematicians*, hath been called in queſtion as well by moderne, as ancient writers. Many matters are miraculouſly,or rather fabulouſly ſpoken of the Mountaine *Athos* in *Macedonia*, of *Caſſius* in *Syria*, and another of the ſame name in *Arabia*,of the mountaine *Caucaſus*,and others:which Hiſtories notwithſtanding are related by no meaner Authors then *Ariſtotle*, *Mela*, *Pliny*, and *Solinus*, yet it is not hard to imagine, that theſe Authors might bee deceiued in thoſe times, either truſting to other mens relations, or wanting *Mathematicall* inſtruments, to ſearch theſe matters: Of the Mountaine *Athos* it is much wondred at, that it ſhould caſt a ſhadow from *Macedonia* into the market-place of *Myrhina* a towne of the Iland *Lemnos*, diſtant from *Athos* 86 miles: But this as our learned Countriman *Mr Hues* well obſerues, can bee no great argument of ſuch a miraculous height; becauſe the mountaine *Athos* ſituate *Eaſt* from *Lemnos* (as may be gathered from *Ptolomies* Table) may without any great wonder caſt a very long ſhadow, the *Sunne* either riſing, or ſetting. Other matters are related of this mountaine *Athos* more ſtrange then the former, to wit, that it ſhould in hight tranſcend the Region of the *raine*, and *wind*,which they would ſtriue to confirme out of an old tradition; that the *aſhes* heaped together on certaine Altars built on the top thereof were neuer blowne away,but remained in the ſame manner as they were left: to which may be added out of *Strabo*, that they who inhabit the top of this mountaine, can ſee the Sunne 3 houres before thoſe who inhabit neere the ſea: The like is reported by *Ariſtotle* of the Mountaine *Caucaſus*, that for the extreame height; the top of it enioyes the *Sun-beames* a third part of the night; Litle leſſe is ſpoken by *Pliny* and *Solinus* of the mountaine *Caſſius* in *Sy-*

ria and by *Pomponius Mela* of the mountaine *Caſſius* in *Arabia*; But how fabulous and incredulous theſe things are, *Petrus Nonius* and other *Mathematicians* haue ſufficiently demonſtrated out of the grounds of Geometry; more abſurd by farre ſeemes that, which *Euſtathius* reports of *Hercules pillars* celebrated by *Dionyſius Perieges*, for their admirable height; whereas they are found not to exceed 100 *ells* making one furlong; a height according to *Strabo* not exceeding the *Ægyptian Pyramides*, and comming ſhort of certaine *Indian* trees neare the Riuer *Hyarotes*, whoſe *Meridian* ſhadowes reach 5 furlongs; Theſe errours in the ancient might ſeeme veniall, had they not bin ſeconded by latter writers: Of the Mountaine *Tenariffe* in the *Canaries*, *Scaliger* is bold to report out of other mens relations, that it riſeth in height aboue 15 leagues, which make 60 miles; but *Petricius* more bold then he, would haue it 70 miles; Litle leſſe is ſpoken of *Pico* amongſt the *Azoris Inſulæ*, and the Mountaine *Andi* in *Peru*; But to confute theſe relatiõs we will vſe this argument; It is reported by the *Spaniſh* writers which haue ſpoken of this place, that the topps of theſe Mountaines ſcarce any one or two moneths in the yeare are free from *ſnow*: Now that *ſnow* ſhould bee ingendred aboue 60 or 70 miles aboue the ordinary plaine of the *Winter* or *Earth*, is againſt the iudgmẽt of our beſt *Aſtronomers*; becauſe, as they haue obſerued out of *Eratoſthenes* meaſure, the higheſt vapors ſeldome reach ſo farre, as 48 miles in height euery way from the Earth. This argument may as well ſerue to confute theſe ancient opinions before mentioned, had they not been ſo fabulous, as ſcarce to deſerue any ſolide confutation.

3 *The* ordinary height *of the* Land *aboue the* Sea *in diuerſe places is more then the hight of the higheſt Mountaines aboue the ordinary face of the Earth.*

We haue probably ſhewed out of former grounds, that the ordinary height of the Earth is anſwerable to the ordinary depth of the Sea, ſo the *hilles* and *mountaines* in proportion anſwere to the *whirle-pooles* and *extraordinary* Gulphes of the Sea: but it is to be imagined that the depth of the Sea in the maine Ocean, is farre more below the ſuperficies of the Earth then thoſe other *whirle-pooles* and *Holes* extend themſelues below that depth. But to proue this by a more ſenſible argument we will compare the one with the other, ſo farre forth as *Mathematicians* by experience haue gueſſed; for it is found by *Mathematick Inſtruments* (as wee haue proued in the precedent Theoreme) that the higheſt *Mountaines* ſeldome or neuer mount vpward aboue ten furlongs, which is an *Engliſh mile*, and a quarter: but the hight of the Land in ſome places where appeare no ſuch hills, is obſerued to be much more: to proue which aſſertion, we can haue no fitter argument then the freſh *Springs* of Riuers; for it is manifeſt that all Riuers are higher at the *Spring* or fountaine, then at the place where they disburthē themſelues into the ſea. Now although *water* is apt to ſlide away at any Inequality, yet it is moſt probable that in greater riuers, eſpecially where the waters fall oftentimes with violence (as at the *Cataracts* of *Nile*) much inequality muſt bee granted in the *Declivity* of the ground: ſuppoſing yet the water for euery mile to gaine two foot in the Declivity of the ground, we ſhal find the hight very neere to equalize the hight of the higheſt *mountaines*; although 2 foot in a mile is farre leſſe then can be imagined in ſo great a Riuer: The Riuer which I take for an example ſhall be *Nilus*, which we ſhall obſerue to runne about 50 Degrees from *South* to *North*, which reſolued into *miles* will make 3000: accompting for euery mile 2 foot, we ſhall haue 6000 foot, which will be neare theſe 10 furlongs, being a mile and 5 parts; then allowing for theſe mighty *Cataracts* where the water falls with ſo great a violence, we muſt reckon a number of feet far greater then this meaſure; for euery mile muſt the hight of land aboue the ſea be much more then of the mountaines.

4 *Mountainous Regions are commonly colder*

then

then other plaine countries.

This propoſition is not abſolutely to bee vnderſtood without a limitation: for ſome *plaine* Countries neere the *Articke* Pole, may be colder then ſome *hilly* Regions neere the *Æquatour*, in regard of other concurrent cauſes: but here we ſpeake (as the *Logicians* vſe) *cæteris paribus*; comparing two places either together like, or not much different, or at leaſt in our vnderſtanding, abſtracting them from the mixture of all other conſiderations: that this Theoreme is worthy credite, diuerſe reaſons ſtand in readines to iuſtifie: the firſt may bee drawne from the cauſe of *heat* in Inferiour Bodies, which is the reflexion of the *Sunne beames*. Now that this *reflexion* is of more ſtrength and validity in *plaine* then in *hilly* and *mountanous* Countries, is euident: firſt, becauſe (as the *Optickes* teach) the *rayes* are more ioyned and combined in a *plaine*, then in a *conuex* ſuperficies; for howſoeuer the whole Earth be of it ſelfe *Sphericall*, yet the *conuexity* being not ſenſible, by reaſon of the vaſtnes of the Circle, whereby the conuexity is made leſſe, it may *optically* be called a *plaine* ſuperficies: Secondly, it is taught in the *Optickes*, that a reflexion is of more validity in an *equall*, then in an vneuen and ragged ſuperficies, ſuch as is found in *Mountaines* and *vneuen* places. A ſecond reaſon why *mountanous* Regions ſhould exceed others in cold, may be the vicinity of them to the middle Region of the Aire; for of all the Regions (if we beleiue *Ariſtotle*) the *middle* is the *coldeſt*, as being more ſeperate from the *Sunne* the fountaine of *heat*, and the higher Region, farther off from the reflexion of the *Sunne-beames*, then the lower: Now ſith the parts of the Earth are affected with the quality of the Aire, it muſt needs ſtand with reaſon, that the more it ſhall approach to the *middle Region*, the more it muſt partake of its quality. Thirdly, that this is conſonant to obſeruation, reaſons are vrged by experience of all Trauailers, who report the topps of *Mountaines* euen in the midſt of Summer to be couered ouer with ſnow, although ſituate vnder or neare the *Æquinoctiall* Circle: Of this nature are the *Alpes* in *Italy*, the *Mountaines* of the *Moone* in *Africke*, *Andi* in *Peru*, and *Tenariffe* in the *Canaries*. That *ſnow* ſhould be an effect of *cold*, I need not labour to confirme. A fourth reaſon may bee drawne from other effects of *cold* or *heat*; for it is daily proued by experience, that ſuch diſeaſes as chiefly follow *heat*, eſpecially the *Peſtilence* in *Ægypt*, and ſuch *plaine Countries*, are wonderfull prevalent, whereas *hilly* and *rockie* Countries by the benefit of Nature ſtand in little feare of ſuch Inconueniences. Laſtly, no greater argument can be drawne, then from the diſpoſition of ſuch men as inhabite ſuch hilly Regions, who haue all the Symptomes of *externall cold*, and *internall heat*: Inſomuch as *Bodin* ſeemes to make a Harmony and Concent betwixt the *Northerne* man and the *Mountaniſt*; the *Southerne* man & ſuch as inhabite *plaine countries*, aſcribing to the former externall *cold*, and internall *heate*: to the latter externall *heate*, and internall *cold*. How farre this compariſon will hold, we ſhall haue more occaſion to diſcuſſe hereafter, when we come to the conſideration of the Inhabitants.

7 *Mountaines ſince the beginning of the world haue ſtill decreaſed in their quantity, and ſo will continually decreaſe vntill the end.*

This obſeruation *Blaucanus*, I know not how truly, aſcribes to his owne Inuention: but to what Author ſoeuer we owe it, we muſt needs acknowledge a pleaſant ſpeculation, grounded on good reaſon. This Theoreme to demonſtrate the better, we will firſt lay theſe grounds oftentimes before-mentioned. Firſt (as appeares by teſtimony of holy Scripture) the figure of the Earth was in the beginning more perfectly *Sphericall*, ouer-whelmed euery-where with Waters. 2ly That a ſeperation was made by tranſlocation of the parts of the Earth, in ſuch manner as ſome places admitting of concauities, became the receptacle of the waters, other places wheron theſe parts of the Earth were heaped together, were made mountanous. 3. Hence will follow, that the Earth thus ſwelling vp in high mountaines, is out of his naturall ſite and poſition: & therefore according to the law of nature, will endeuour by litle and litle to returne to her former ſtate and condition. Now that the Earth hath ſenſibly ſuffered ſuch a change ſince the beginning, it is eaſie to ſhew out of experiments: the cauſes we ſhall find to be the *water*, aſwell of the *Rain* as *Riuers*, which we ſhall demonſtrate by theſe Reaſons: 1 We ſee *Riuers* by litle and litle continually to fret and eat out the feet of *mountaines*, whẽce the parts thus fretted through, by cõtinuall falling downe weare out the mountaines, and fill vp the lower places in the valleyes, making the one to encreaſe, as the other to decreaſe, & the whole Earth to approach nearer to a *Sphericall* figure then before; which ſeemes to be warranted by a place in *Iob* 14, where he ſaith to God; *The mountaine falling, commeth to nought, & the rocke is remoued out of his place. The waters weare the ſtones, thou waſheſt away the things which grow out of the duſt of the earth.* From theſe Riuers in the valleyes continually eating through the parts of the Earth, as the feete of mountaines are cauſed thoſe ſlow but great Ruines called *Labinæ, a lambendo*, by which ſometimes whole Townes and Villages haue bin caſt into the next great Riuer. 2 To proue that Raine water challengeth a part in this diminution of mountains, we may ſhew by the like experiẽce: we ſee plainly that Raine-water daily waſhes downe from the Toppes of mountaines ſome parts of the Earth; whence it comes to paſſe that the higheſt mountaines are harder and more rocky then others, as being more able to reſiſt this violence of the water. Hence alſo it happens that old buildings being erected in the ſides of mountaines, haue their foundations after a time vncouered, and are much ſubiect to Ruines: an inſtance whereof may bee giuen out of the *Romane Capitoll*, whoſe foundation (according to the relation of *George Agricola*) appeares now plainly aboue the ground, which without queſtion was heretofore deepe rooted in the Earth. In Plaines and valleyes we find all things to happen contrary wiſe, to wit, that all places in regard of their ſuperficies are raiſed much higher then they were in times paſt, The reaſon whereof may eaſily be giuen out of the great quantity of the Earth, carried by the waſhing of the Raine from the Topps of mountaines into the valleyes: whence we may perceiue old houſes, heretofore fairely built, to be now almoſt buried vnder ground, and their windowes heretofore ſet at a reaſonable hight, now growne euen with the pauement: ſo ſome write of the Triumphall Arch of *Septimius* at the foot of the Capitoll Mountaine in *Rome*, now almoſt couered with Earth, inſomuch as they are inforced to deſcend down into it by as many ſtaires as formerly they were vſed to aſcēd. In like ſort we ſee in old Monaſteries & Religious houſes, their lower roomes, windowes, & doores, very far couched vnder groũd, of which great incōuenience we cannot ſuſpect the Architects iudgment; but rather onr fore-mentioned cauſe: from this burying of parts of ſome houſes vnder ground, it may be gathered, that the farther they are vnder ground, ſo much ancienter they are: as we may obſerue heere with vs in *Oxford*, that our moſt ancient Colledges haue the windowes of their lower roomes, ſome-where altogether choaked vp with Earth without, or at leaſt halfe way, in ſomuch as the flore within, is found to bee farre inferiour in height to the ſtreet without: This is alſo confirmed by Architects, who in digging vp old foundations, before they came to firme ground whereon to erect a building, are enforced firſt to remoue away the *Rubbiſh* or (as they terme it) the *Made-ground*; wherein oftentimes they find *Wood*, *Iron-Inſtruments*, *old coine*, with diuers other Traſh of this Nature. An inſtance we haue in ſome of the lower places in *Somerſetſhire*, where ſome vpon occaſion digging the Earth ſomewhat deep, haue found great *Okes* turned topſy turvy with their Roots vpwards. To coniecture with ſome, that this was cauſed by *Noah's Floud*, ſeemes to be very improbable: 1 becauſe as we haue formerly ſhewed in this Chapter, the Water in the *Deluge* could not haue ſo violent a motion to procure ſuch an alteration in the parts of the Earth. 2 It cannot ſo well be imagined how ſuch Trees ſhould remaine ſo long a time without putrefaction: wherefore we cannot well caſt it on any other cauſe, then the addition of the earthly parts, brought by raine from the mountaines into the valleyes: and ſo by ſome Land-flood which partakes much of ſlimy and earthly matter diſperſed abroad vpon the land about. Now on the contrary part wee find in few places of mountaines ſuch *made-ground* which hath before beene moued. This will alſo appeare out of the induſtry of our *Low-countreyman*, who by baying vp the Riuers into certaine Artificiall Channels, the ground about hath been much raiſed: where on the contrary ſide the forcing of the water into higher places, oftentimes is found to fret through the Earth, and make it lower. What we haue ſpoken of the effects of Riuers and Raine in diminiſhing the greatnes of the mountaines and exalting of the vallyes, we may in ſome ſort find in the ſea. For the bottome of the Sea being lower then the Earth, and many great Riuers continually running from the Earth into it; it is manifeſt that there is carried in their current a great quantity of earth, in ſo much as by the heaping of ſand and earthly rubbiſh, the mouthes of great Riuers are in time choaked vp, and commodious hauens ſpoyled and remoued farther into the land: of which alternall tranſmutation of the Sea and Land we ſhall ſpeake hereafter: & for preſent inſtance need to goe no farther then diuerſe Townes in *Deuon*, which (according to the Relation of ancient men) haue heretofore been faire hauens, able to receiue great ſhips, to which notwithſtanding at this time a ſmall boat cannot arriue except in a full Tide. The like whereof is reported by *Ariſtotle*, 1 of a place in *Egypt* called *Delta*, made by the heaping vp of ſand and ſlime, brought by *Nilus* from the *Ethiopian* mountaine. 2 of *Ammania Regio*, which in times paſt being Sea, through the ſlime conuayed in the Riuers, became afterwards as a ſtanding poole, which in proceſſe of time waxed dry, and ioyned it ſelfe to the Continent. 3 Of *Mæotis Palus*, that the dry land enuironing it round, is ſo much encreaſed, that ſhips of that burthen cannot arriue, which could in times paſt within 60 yeeres before; which is alſo in ſome ſort teſtified by *Polybius*. 4 The like is related of *Boſphorus Thracius*, and many other places recorded by *Pliny*, of which we ſhall ſpeake hereafter. From theſe obſeruations *Blancanus* would inferre theſe conſectaries: 1 That the Earth was not from the begin-

1 *Meteor.*

Lib. 4.

beginning endowed with mountaines: 2 That it ſhould not ſo continue vntill the end of the world; and vnleſſe the Fire (whereof the Scripture ſpeakes) ſhould preuent it, the whole Earth ſhould in the end be ouer-whelmed with waters, as in the beginning, and ſo be made void of habitation: but on ſuch coniectures I dare not too boldly venture, being ſpeculations built on no ſufficient grounds: All which can hence warrantably be collected is expreſſed in our former Theoreme.

2 Of the *Figurature* of Countreyes in *Mountaines*, *Valleyes*, and *Plaines*, we haue ſpoken: It is requiſite here wee ſpeake ſomewhat of *Woods* and *Champian* Countreyes.

3 A *Wood* is a Region or ſpace of Land beſet with trees. A *Champian* Region is a ſpace of Land either altogether voide, or ſcarce furniſhed with trees.

Some Criticks here curiouſly diſtinguiſh in Latine, betwixt *Sylua*, *Lucus*, and *Nemus*: by *Sylua* vnderſtanding a ſpace beſet with trees, ordained to bee cut downe; but *Lucus* was a place where trees were not ordained to bee cut downe, but reſerued ſacred: For in ſuch groues they did anciently vſe to offer ſacrifice, as may appeare by diuerſe places out of the Old Teſtament, where the Heatheniſh manner of worſhipping was forbidden, and ſometimes reproued in the Kings of *Iuda* and *Iſrael*: That which the Latines call *Nemus*, is a Groue or Wood ordained onely for pleaſure and recreation: but the diſcuſſing of theſe buſineſſes rather belong to a *Grammarian* then a *Geographer*; who takes little notice but of thoſe matters which moſt principally and remarkeably belong to any Region; wherefore omitting other curioſities, wee haue diſtinguiſhed onely betweene a *Woody* and a *Champian* Countrey; whereof (as wee haue defined) one is beſet with a multitude of trees; the other with few or none. What concernes a *Geo-*

grapher to obſerue in thoſe matters,ſhall generally be compriſed in this Theoreme.

1 *Woods in theſe dayes are not ſo frequent, nor ſo great as in ancient times.*

We cannot imagine otherwiſe then that the Earth ſoone vpon the flood, bearing in her wombe the ſeeds of all vegetals, being inwardly moiſtned, and outwardly comforted with Heat, ſhould preſently abound with plants of all ſorts; in ſo much as in a ſhort time each thing propagating it ſelfe by communication of his own ſeeds, the whole Earth was ouergrown as one forreſt: but afterwards as man began to ſpread and multiply on the face of the Earth, theſe Woods and Thickets began to ſuffer chaſtiſement vnder the hand of laborious husbandry: For firſt to open a paſſage from one place vnto another, and that ſome parcels of ground ſhould as paſtures bee diuided from Woody acres, it was neceſſary that this great plenty of trees ſhould ſuffer a decreaſe: yet little had this beene noted in ſo vaſt a ſtore, had not the inuention of building of houſes by little and little turned great forreſts into Cities; which for the moſt part owed not only their firſt originall,but alſo their daily reparation to Trees and Timber: but aboue all the greateſt deuourer of Woods and Forreſts is Fire,an element fed and nouriſhed almoſt of no other matter. For to let paſſe the ordinary vſe of fire in euery houſe and family, which in ſo infinite a multitude of people, in ſo many yeeres ſince the Flood, muſt require an extraordinary proportion of wood and fuell, how many Arts haue beene ſince inuented, depending onely vpon this Element? we will goe no farther then the Art of *Liquefaction*, fining of gold and other mettals, found out in the bowels of the Earth, wherein the couetouſneſſe of men hath been as vnſatiable as the fire. To this which wee haue ſaid,may probably be oppoſed two things: firſt, the power and inclination of euery Creature to multiply and propagate it ſelfe. Secondly, the induſtry of mankind in ſeconding that inclination: Whence it may bee coniectured that great woods ſhould by durance increaſe to a greater quantity: for the former,no man will deny, but that plants and trees left to themſelues, will commonly propagate their kind: neuertheleſſe it cannot preuaile ſo much as the other, which procure the decreaſe: firſt becauſe the Earth being dryer now, then ſoone vpon the Flood, cannot ſo much further the growth of vegetals as then it did: Secondly, becauſe (as wee haue ſaid) this growth in a populous Countrey, cannot bee ſo great as the diminution, ſince few or no houſes can want ſo neceſſary an Element as fire. To the ſecond wee anſwer that mans induſtry hath done ſomewhat in plantation of groues, and ſuch like: but how little is this in compariſon of the huge and vaſt forreſts in time by man waſted and conſumed. We ſhall read of *Germany*, that in the time of *Cæſar* it ſeemed a wilde Countrey, hauing many great woods and forreſts, but few Cities: but now the caſe being altered, we ſhall find the Cities both in number and greatnes increaſed, and the Woods diminiſhed. Two inſtances may ſuffice, the one of the Forreſt of *Ardenna* in *Lutzemburg*, accompted in *Cæſars* time 500 miles ouer, now ſcarce 50. The other of *Sylua Hyrcinia*, which heretofore (if we beleeue Hiſtories) reached ſo far as a man could trauaile in 60 dayes; but now is made the onely limit or bound diuiding *Bohemia* from the reſt of *Germany*. The like may bee obſerued almoſt of euery other Countrey reduced to ciuility.

2 *Places moderatly ſituated towards the North or South Pole abound more in Woods then neere the Equatour.*

This ſituation wee vnderſtand to comprehend almoſt all the temperat Zone, reaching either way ſo farre as 60 degrees or there about. The demonſtration of this Theoreme depends of theſe two foments of all plants, Heat and Moiſture; both which concurre, not only to the abundance and fertility, but alſo to the greatneſſe of all plants; for it is moſt certaine that whereſoeuer theſe two vitall ſuccours are wanting or deficient, there muſt be a great ſcarcity of *trees, fruits, herbage*, and ſuch like: This is the cauſe why the Regions far North neere about the Pole, beyond 60 degrees, haue not onely ſcarcity of trees, but haue them ſuch as are, of a farre ſmaller quantity then other Regions; lying more temperate: For the internall and naturall heat is almoſt extinguiſhed, with the extremity of cold, and the moiſture (as it were) dried vp by the froſty diſpoſition of the Region. To this cauſe may wee aſcribe, that which Geographers haue deliuered concerning Iſland, that for want of Timber they couer their houſes with fiſh-bones; digging out houſes in the ſides of Rockes and mountaines. Moreouer that the meere defect of moiſture may cauſe a ſcarcity of growth, may bee proued by many places: 1 becauſe temperate Regions, which are Mountainous and lying higher, produce trees of ſmall length; *Bodin* teſtifies as a thing very remarkeable, that hee hath obſerued oakes in *France* not exceeding 3 or 4 feet. But this is no great wonder with vs in *England*: ſith in the dry and barren plaines about *Salisbury* there are many examples not much different: All which, we can aſcribe to no other cauſe then the want of moiſture. On the other ſide as great or greater a defect of heat & moiſture, is found neere the *Equatour*, by reaſon of the externall heat of the Sunne; which in all plants and vegetalls, not onely euaporates the moiſture, and by conſequence cauſeth drowth; but by the extraction of Internall heat, leaueth a greater cold behind, correſpondent to that humour in a man, which we call *Melancholy* and *choler-aduſt*: But this extremity of heat cauſing this defect of internall heat & moiſture, wee place not directly vnder the Equinoctiall; becauſe we haue ſhewed it to be more temperate: but rather vnder the *Tropicks*, which by experience are found ſcorched with great heat. How ſubiect theſe places vnder the *Tropickes* are to this ſterility, we need goe no farther then *Libia* and *Numidia* to confirme; Places by the report of trauailers, indigent not onely of Woods and Trees, but almoſt of all vitall ſuccours. Whereas the Woods & Forreſts diſperſed almoſt in euery region of *Europe*, and the more temperate parts of *Aſia*, are celebrated of all writers. Yet whereas wee haue defined the chiefeſt places for the growth of Woods to be towards the North, ſo farre as 60 degrees

grees or there-abouts ; wee cannot warrant this as an abſolute generall obſeruation;becauſe ſome places lying very low, and ſubiect to much moiſture, though ſituat more Southerly , may enioy this proportion , as we haue formerly ſhewed of trees neere the Riuer *Hiarotis* recorded by *Strabo* , to haue their noone ſhadowes of 5 furlongs , as alſo of certaine trees in *America* neere *Riuo Negro* , wherein (as *Peter Martyr* writes) a King dwelt with all his family. But theſe places howſoeuer ſituat towards the South are (as *Geographers* deliuer vnto vs) moſt times of the yeere ouerwhelmed with Water, conſiſting all of mariſh grounds : yet theſe few inſtances drawne from the particular diſpoſition of the Earth it ſelfe, cannot much impeach our propoſition , which takes notice only of the ſituation of the Earth , in reſpect of the cardinall points of North and South, compared with the Heauens.

CHAP. XI.

1 Hitherto haue we treated of the Abſolute adiuncts of the land ; we are now to ſpeak of the Relatiue, which imply a reſpect of the Land to the Sea.

2 From this Termination of the land with the ſea , there ariſeth a twofold diſtinction : The firſt is of the land into *Continent* and *Ilands*.

3 A *Continent* is a great quantity of land conſiſting of many Kingdomes and Regions, not diuided by Water, the one from the other :

An *Iland* is a parcell of land compaſſed round with the ſea.

An Iland is called in Latin *Inſula*, *quaſi in ſalo*; becauſe it ſtands in the Sea; ſome would haue it in *Engliſh* termed an *I-land*, as it were, *Eye* of the *land*: But this deriuation ſeemes affected and not naturall: it might ſeeme more naturally to be deriued from the *French L'Iſle*. But wee will not diſpute of the name: It is enough to vnderſtand, that an Iland is a portion of the habitable Earth, euery where enuironed with the ſea, or at leaſt with ſome great Riuer: but this laſt ſenſe ſeemes more improper then the other; yet oftentimes vſed, as *Meroë* in *Africa* an Iland of *Nilus*, and the Iland of *Eely* in *England*. To this is oppoſed the *Continent*, as that land, which being not diuided and ſeparated by the ſea, containes in it many Empires and Kingdomes, as *Europe*, *Aſia*, *Africke*, *America*; all which, as farre as wee can yet gather, are vnited and ioyned together, in one continuate land; *Strabo* affirmes out of this in his 1 Boooke and firſt Chapter of *Geographie*, that the whole Earth is one *Iland*; ſith all theſe knowne parts of the Earth, are compaſſed about with the ſea on euery ſide: But this opinion cannot ſtand with reaſon, or moderne obſeruation: Firſt, becauſe this acception is too large; for as much as an Iland is properly taken for a ſmaller part, diuided from the reſt of the land, and oppoſed to the *Continent*; whereas if this ſenſe were admitted, the diſtinction of land into *Continent* and *Iland* would haue no place, or at leaſt the ſame in a diuerſe reſpect, might bee called a *Continent* and an Iland. But it is plaine that Ilands were alwayes oppoſed to the continent, to which, although ſeparate by Water, they were ſuppoſed to belong, as to *Europe*, *Aſia*, *Africke*, *America*, or *Magellanica*, or ſome other as *Geographers* haue reduced them. Secondly, becauſe it was a bold coniecture to thinke the whole world to conſiſt only of thoſe parts, found out in *Strabo's* time: For beſides the two parts of *America* ſince that time diſcouered by *Columbus*, another great portion is ſince that time found out in the South, by the coniecture of *Ferdinando de*

Quir, comming neere the quantity of *Europe*, *Aſia*, and *Africa*. Which howſoeuer it be round enuironed with ſea, and therefore might ſeeme an Iland, yet in reſpect of the greatnes of it, and the many regions and kingdomes it containes, it may well bee reputed a continent: To which many leſſer Ilands belong.

1 *It is probable that Ilands were not from the firſt creation, but were made afterwards either by the vniuerſall deluge, or ſome other violence of the Water.*

It hath been the opinion of diuerſe learned men, that Ilands were not onely before the Flood, but from the firſt creation of the world: becauſe they ſeeme no leſſe to make for the ornament of the Earth, then diuers Lakes and Riuers diſperſed on the Land. But this argument ſeemes very weake: firſt becauſe a greater ornament ſeemes to conſiſt in vniformity then confuſion; beſides, the ornament muſt not bee meaſured by our phantaſie, but Gods Almighty pleaſure and will expreſſed in his owne workmanſhip: and that hee created Ilands in the beginning, is the thing in queſtion. That Ilands were not from the Creation, many probable reaſons are alleaged: Firſt from the words in the 1 of *Geneſis*: *Dixit verò Deus, congregentur aquæ quæ ſub cœlo ſunt, in locum vnum, & appareat arida: & factum eſt ita; & vocauit Deus aridam, terram; congregationeſq́; Aquarum appellauit maria.* By which may be collected, that the waters were gathered together in their own place, by themſelues, and therefore had no ſuch intercourſe betwixt Land and Land as now they haue, admitting Ilands: wherefore it is more probable, that ſuch Ilands as now appeare were either cauſed by that Vniuerſall Deluge of *Noah*, or by ſome other Accidents: for it is moſt certaine that the Sea on the Land ſome-where gaines, and other-where in recompence of it, it looſeth againe: as may appeare by the 14 of *Geneſis*; where it is ſaid of the comming together of certaine Kings: *Hi omnes conuenêrunt in vallem Syluestrem, quæ nunc eſt mare* *ſalis*: out of which it is euident that that parcell of ground which was a woody place in the time of *Abraham*, was before the time of *Moſes* become the Salt Sea. Many examples of the like are giuen vs by *Pliny* in his Naturall Hiſtory, which we ſhall haue occaſion to vrge hereafter: And therefore it is no hard thing to belieue, that ſince the firſt beginning of the world all Ilands might bee produced in this ſort. Another argument by which they would eſtabliſh this opinion, is that wee ſee almoſt all Ilands of the Earth not onely inhabited of mankind, but alſo furniſhed with diuerſe kindes of Beaſts, ſome tame, ſome wilde, ſome wholeſome, ſome venomous; ſome vſefull, ſome altogether vnprofitable. Now it ſeemes very vnlikely that men being in elder times, and now alſo in moſt places of the Earth, altogether vnskilfull in the Art of Nauigation, ſhould venture ſo farre on the maine Ocean, to people Countreyes ſo far diſtant; ſith at this day, wherein Nauigation is arriued at a great perfection, hauing the helps both of the Chart and Compaſſe, altogether vnknowne vnto the ancients, wee ſee moſt Nations very ſcrupulous in ſearching out farre remote Countreyes. But admit this were ouercome by mans Induſtrie, which no doubt is much increaſed by Neceſſity; yet cannot it bee very probable, that ſo many ſundry kindes of beaſts ſhould in this ſort bee tranſported: for howſoeuer wee coniecture concerning ſuch beaſts as neceſſarily ſerue for mans ſuſtenance; yet ſeemes it hard to thinke that man ſhould bee ſo improuident and enuious to the place of his own Habitation as to tranſport rauenous, venomous, vnwholeſome, and vnprofitable creatures: for by no other meanes but by tranſportation can ſuch beaſts bee imagined to bee brought into Ilands: For the firſt originall of all creatures in the Creation was in or neere Paradice, which wee ſhall proue to haue been in the Continent of *Aſia*; the ſecond Seminary was in the *Arke*, which by the teſtimony of the Scriptures was firſt disburthened in the ſame Continent. How from hence they ſhould ſpread themſelues into Ilands, is the doubt. Impoſſible it ſeemes they ſhould ſwimme ſo far; for what Creature will venture it ſelfe on the maine Ocean being by a naturall inſtinct fearefull of death, and carefull of his owne preſeruation: Whence it is more likely to imagine, that theſe parcels of land being firſt furniſhed with ſuch creatures, were afterwards by the violence of the flood, or ſome other like Accident, torne off from the maine Continent, retaining ſtill ſuch Creatures as it had before. But here *S. Auguſtine* ſeeme to auoid this Argument two wayes: It is not (ſaith he) incredible, that wild and ſauage beaſts might bee tranſported from one Countrey to another by Sea: either by Men for the delight of Hunting; or elſe by the helpe of Angels by Gods Commandement, or at leaſt permiſſion. This anſwer ſeemes very probable as well for it ſelfe, ſuppoſing nothing impoſſible to Almighty God, as alſo for the authority of the Author. But with all reuerence to the Authour, whom all the Chriſtian Churches are bound to honour, this aſſertion is not ſo ſtrongly fortified to enforce aſſent. And firſt it is not very likely that pleaſure with men ſhould ſo farre ouerſway the generall weale and profit, as to tranſport ſo many rauenous and hurtfull beaſts, for meere hunting ſports and recreation. Secondly, the chaſe of ſome, as *Lions*, *Leopards*, and ſuch like, hath more danger in it then ſport or delight; and if ſo be theſe were conueyed ouer Sea for ſuch ends, yet it is very probable, they would keepe them rather cloſe and impriſoned to ſerue occaſion, then to let them looſe and free for farther propagation. Finally, whereas hee aſcribes the tranſportation of them to the miniſtery of Angels; no man can deny but this may bee poſſible; becauſe by their permiſſion of Almighty God they might effect greater matters. Yet ſeemes this not ſo likely as the other, becauſe wee finde that in the generall preſeruation of all creatures in the Arke, hee vſed the ordinary helpe of Naturall meanes, although directed and aſſiſted by a Diuine power: And of God effected greater matters in this ſort, why may wee not belieue it of things of leſſer moment and neceſſity? But of this wee haue ſpoken before. Another reaſon for our opinion that Ilands were not before the flood, or at leaſt from the Creation, is vrged by *Verſtegan* a late Writer in this manner: There is nothing broken) (ſaith he) that hath not bin whole; which he ſets downe as an infallible principle: for howbeit Nature doth ſometimes againſt her own intent commit ſome errours, in ſo much as the things formed haue either too much, or too little; yet bringeth ſhe forth nothing broken or diſſeuered; but ſuch as it is, it is alwayes whole and not broken, except afterwards by ſome accident. And if Nature, the hand-maide of God, neuer miſſeth this perfection, much more ought wee to belieue that God the Father of Nature in the firſt Creation left no part thereof broken and vnperfect. But euery man may ſee by ordinary obſeruation, that the *Clifts* and *bounds* of the Sea (as not being by God in the creation ſo formed) ſeeme not onely ſeuered and broken, but (as it were) cut *ſtreight* and *ſteep* downe from the top to the bottome, not ſtooping or declining by degrees; as wee ſee in *Inland Hills* in their deſcent vnto the valleyes. The forceable breach of the land (as wee pretend) by the Sea fretting through ſome narrow place, ſeemes the more to be confirmed in that we find it not ſteep towards the Land, where the Land declines by a ſloping deſcent as in other places; but rather towards the Sea in ſuch ſort, as both the ſides of a narrow and ſtreite Sea oftentimes in the nature of the ſoile, and conformity of figure, ſeeme to anſwer one other; onely ſhewing the want of ſubſtance betwixt them which is loſt. It may hence be obiected that many other hills and rocky places of Iland Countreyes, ſeeme in like manner as broken and ſteep downe as theſe *clifts* bounding the Ocean: as alſo that the *clifts* towards the Sea are broken higher vp then any waies the Sea could be imagined to aſcend. To this wee anſwer, firſt that rocks on the dry land many times ſeeme broken, when indeed they are not, being by Nature faſhioned craggie and vneuen: Secondly, whereas Hills in Inland countries ſeeme broken, this might proceede heretofore by Earthquakes which haue oftentimes beene obſerued to produce ſuch effects as it hath lately beene knowne to doe in a Towne called *Pleurs* in the *Griſons* Countrey neere the *Alpes*: and for the appearance of ſuch breaches in the tops of clifts aboue the aſcent of the waters, it might bee cauſed by the violence of the Sea-waues, fretting and eating out the ſides of them beneath the bottome; whence it happens that the higher part for want of vnder-propping muſt needes fall and breake off from the other. This Argument of our ſaid Authour is by him back't with another, drawne from the name of a *cliffe*, which in our ancient language is drawne from cleauing or breaking off: which appellation is neuer giuen to our Inland Hils, but only to ſuch as terminate and compaſſe in the Sea. Theſe reaſons make the matter ſeeme probable; yet condemne I not the other as abſurd, becauſe it may probably be defended, and backt with the authority of many graue Authors.

4 A ſecond Diſtinction ariſeth out of the termination of the Land with the Sea: For either it is *vniforme* or *various*.

5 An vniforme termination I call that which without any notable difference inclines more to euenneſſe and Regularity.

It is manifeſt that the Sea-wawes working on the Land violently, and not naturally, ſeldome or neuer ſo bound and compaſſe the Land, as to reduce it to a regular and perfect figure. But yet becauſe in ſome places it comes ſomewhat neere to ſuch a figure, ſomewhere it is very farre off; wee thought it fit to inſert this diſtinction. This inclination to a Regular figure is ſome-where ſquare, conſiſting of Right-lines, ſome-where circular; an example of the former we haue in *Spaine*, which on the North-ſide, and the Weſt is bounded more ſtreitly, comming neere a right-line: of the other in *Africke*, whoſe North-Weſt ſide from the *Mediterranean* ſtreits to *Guinea* ſeemes in ſome ſort circular.

6 A various Termination is that wherein the bounds are crooked, and as it were indented with crekes and turnings. Here three

things are remarkeable. 1. *Peninſula*, *Iſtmus*, and *Promontorium.*

7 A *Peninſula* is a part of land euery where enuironed with the ſea, excepting in one part, where it is knit vnto the maine land: An *Iſtmus* is a narrow land betwixt two ſeas: A *Promontorie* is a high mountaine bending it ſelfe into the ſea: the head whereof is called a *Cape:*

Theſe three are remarkeable accidents growing out of the Termination of the land with the ſea, and belonging as well to continents as Ilands. The firſt we call *Peninſula*, *quaſi penè Inſula*, termed of the *Græcians Cherſoneſus*, although I find this name oftner giuen to the *Iſtmus* then the *Peninſula*. Amongſt the *Peninſula's* the moſt famous are *Africa*, *Scandia*, *Taurica Cherſoneſus*, *Peloponneſus*, and *America Peruana.* That little parcell of land which ioynes this *Peninſula* with the maine land, we call an *Iſtmus*; which is a narrow necke of land betwixt two ſeas, ioyning two Continents; ſuch as are *Jſtmus Corinthiacus* and *Iſtmus Cimbricus*: more famous are thoſe two narrow lands, whereof the one lyeth betwixt *Peruana*, and *Mexico* in *America*, the other diuiding *Africke* from *Aſia*. A *Promontorie* is a great mountaine ſtretching it ſelfe far into the ſea: whoſe extremity is called a *Cape* or *Head*, of which the moſt remarkeable are the *Cape of good hope* in *Africke*, 2. The *Cape of S. Vincent* in *Portugall*, 3. The *Cape of Comary* in *Aſia*. 4. The *Cape de la Victoria* in *America*. Our obſeruation concerning this diſtinction ſhall bee compriſed in this Theoreme.

1 Peninſula's *by the violence of the ſea fretting through the* Iſtmus, *haue oftentimes beene*

beene turned into Ilands: *and contrariwiſe ſometimes Peninſula's by diminution of the ſea made of Ilands.*

This propoſition is not hard to proue, if any credit ought to bee giuen to ancient writers: for it is commonly related, that *Sicily* was heretofore ioyned to *Italy*, *Cyprus* to *Syria*, *Eubœa* with *Bœotia*, *Besbicum* with *Bythinia*; all which at this day are Ilands ſeparated and diuided from the continent. The like hath beene coniectured of our *Brittany*, which ſome imagined heretofore to haue beene ioyned with the continent of *France*, about *Douer* and *Calais*: as may ſeeme probably to be gathered out of the correſpondency of the *Cliffs* (whereof we haue ſpoken in this chapter before) the agreement of the ſoyle, the ſmalneſſe of the diſtance, and many more arguments remembred by vs elſe-where. Alſo it hath beene obſerued on the other ſide, that the ſea in ſome places leauing his ancient bounds, hath ioyned ſome Ilands to the land, making *Peninſulas* of Ilands. In this ſort if wee belieue antiquity was *Antiſſa* ioyned to *Lesbos*, *Zephirium* to *Halicarnaſſus*, *Ethuſa* to *Mindus*, *Promiſcon* to *Miletum*, *Narthucuſa* to the *Promontory* of *Parthenius*: In theſe antiquities it behooues euery man to iudge without partiality, according to reaſon, not aſcribing too much to fabulous narrations, wherein thoſe ages did abound, neither yet ſhewing himſelfe too incredulous: For as much as we cannot charge theſe Authors with any manifeſt abſurdity. The ſpeciall and particular arguments by which wee ſhould eſtabliſh our aſſertion, wee muſt according to the rules of method reſerue to the ſpeciall part, where we ſhall treat of ſpeciall Countreyes.

CHAP.

CHAP. XII.

1 OF the perpetuall Accidents of the land, we haue ſpoken ſomewhat: it remaines in this place wee treat of the Caſuall.

2 The caſuall I call ſuch as happen not ordinarily at all times: ſuch as are *Inundations* and *Earth-quakes*.

3 An Inundation is an ouerwhelming of the land by Water.

Howſoeuer it bee certaine out of holy Scriptures, that God hath ſet the ſea his certaine bounds and limits, which it cannot paſſe: yet the ſame God ſometimes to ſhew his ſpeciall iudgement on ſome place or age, hath extraordinarily permitted the ſea ſometimes to breake his appointed limits, and inuade the Iuriſdiction of the land. This wee call a Deluge or Inundation. The inundations which euer haue been obſerued on the Earth, are of two ſorts, either Vniuerſall or particular: An vniuerſall is that whereby the whole face of the Earth is couered with water; whereof we haue onely two examples: The firſt was in the firſt creation of the world, when (as wee read in the Scriptures) the whole face of the Earth was round inueloped with Water, which couered the tops of the higheſt mountaines, till ſuch time as God by a ſupernaturall hand, made a ſeparation of the Waters from the dry land: But this is improperly called an Inundation, becauſe, the ſame properly taken implies as much as an ouer-flowing of that which was dry land before: The ſecond (as we read in *Gene-*

ſis) happened in the time of *Noah*, when God for the ſinne of man, drowned the whole world, breaking open the cataracts of Heauen, and looſing the ſprings of the deepe. Particular inundations are ſuch, as are not ouer the whole Earth, but in ſome particular places or regions; Such a deluge (according to *Genebrardus*) happened in the time of *Enos*, wherein a third part of the Earth was drowned. The like is ſpoken of *Ogyges* King of *Athens*, that in his time happened a very great *Inundation*, which drowned all the confines and coaſts of *Attica* and *Achaia* euen to the *Ægean* ſea: In which time it was thought that *Buras* and *Helice* Cities of *Achaia*, were ſwallowed vp; whereof *Ouid* in his Metamorphoſis, ſpeakes thus.

Si quæras Helicen & Buran Achaidos vrbes.
Inuenies ſub aquis:
Buras and Helice on Achaian ground
Are ſought in vaine, but vnder ſeas are found.

As famous was the Inundation of *Theſſaly* in *Deucalions* time mentioned not onely by profane writers and Poets, but alſo by *S. Auguſtin, Ierom*, and *Euſebius*, which would haue it to happen in the time of *Cranaus*, who next after *Cecrops* gouerned *Athens*. This inundation was exceeding great, extending it ſelfe not onely ouer all *Theſſaly* and the regions adioyning weſtward, but ouerwhelmed the greateſt part of *Italy*. The ſame or other happening neere the ſame time, oppreſſed *Ægypt*, if *Euſebius* may obtaine credit. Hence ſome would haue the people of *Italy* to haue been called *Vmbrij* (as *Pliny* and *Solinus* report) *quia ab imbribus diluuij ſuperfuiſſent*. But this *Etymologie* ſeemes too farre fetcht. There are alſo two other notable Inundations mētioned by ancient writers, which fell out in *Ægypt* from the Riuer of *Nilus*; whereof the firſt couered all the neither *Ægypt*, which was ſubiect to *Prometheus*, and hence (as *Natalis Comes* obſerues) was the fable drawne of the *vulture* lighting on *Prometheus liuer*, afterwards ſlaine by *Hercules*. For (as *Diodorus Siculus* obſerues) the Riuer *Nilus* for the ſwiftnes of his courſe was in ancient time called an *Eagle*. This Riuer afterwards did *Hercules* by his great skill and iudgement ſtreiten and bound, reducing it into narrow channels: whence ſome Greeke Poets turning *Hercules* labours into fables, faigned that *Hercules* ſlew the *Eagle* which fed on *Prometheus* breſt, meaning that hee deliuered *Prometheus* out of that ſorrow and loſſe which hee and his people ſuſtained by that Inundation. The ſecond of theſe *Egyptian* flouds happened about *Pharus* in *Egypt*, where *Alexander* the great built *Alexandria*. To theſe may bee added many more of leſſer moment, as well in ancient times as in our dayes: As that of *Belgia* in ſome parts mentioned before, on another occaſion; and not many yeeres ſince in ſome parts of *Somerſet-ſhire* with vs in *Britanny*.

1 *No vniuerſall Inundation of the Earth can be Naturall: The other may depend on ſome Naturall cauſes.*

Of the cauſes of Inundations many diſputes haue beene amongſt Naturall Philoſophers: ſome haue truſted ſo farre to Nature, that they haue aſcribed not only particular Inundations, but that vniuerſall Deluge in the time of *Noah* to ſecond cauſes: of this opinion was *Henricus Meclienſis* a Schollar of *Albertus Magnus*, who in his Commentaries vpon the great Coniunctions of *Albumazar*, obſerued that before *Noahs* flood, chanced a coniunction of *Iupiter* and *Saturne* in the laſt degree of *Cancer*, againſt the conſtellation ſince termed *Argo'sſhip*: out of which he would needs collect, that the floud of *Noah* might haue beene fore-ſhowne; becauſe *Cancer* is a watry ſigne, and the houſe of the *Moone* being miſtriſſe of the Sea, and all moiſt bodyes according to *Aſtrologie*: which opinion was afterwards confirmed by *Petrus de Alliaco*, who affirmes in his Comment vpon *Geneſis*, that although *Noah* did well know this flood by diuine Reuelation; yet this coniunction being ſo notable, hee could not bee ignorant of the cauſes thereof; for thoſe were not only ſignes, but alſo apparant cauſes by vertue receiued from the firſt cauſe, which is God himſelfe. Further to confirme this aſſertion hee would haue *Moſes* by the *cataracts* of Heauen, to haue meant the great & watry coniunction of the Planets. A reaſon wherof hee ſeemes to alleage, becauſe it is likely that God would ſhew ſome ſigne in the Heauens, by which all men might be warned to forſake their wicked courſes. But notwithſtanding this curious opinion, I rather cleaue to thoſe which thinke this Deluge to be meerely Supernaturall, which I am induced to beleeue for diuers cauſes vrged by worthy writers. Firſt, becauſe this is ſet downe in Holy Scripture for a chiefe token or marke of *Noahs* extraordinary faith & dependance vpon Gods promiſes: which had been much diminiſhed, and of ſmall moment, had it any way been grounded on the fore-ſight of ſecond cauſes. For this was no more then might haue beene diſcouered to the reſt of the wicked worldlings, who no doubt would in ſome ſort haue prouided for their ſafety, had they receiued any firme perſwaſion of this dreadfull Deluge. To which others adde a ſecond reaſon, that ſecond cauſes of themſelues, without any change or alteration, are not able to produce ſuch an admirable effect as the drowning of the whole World: for it is not conuenient (ſay they) that God the Author of Nature ſhould ſo diſpoſe and direct the ſecond cauſes, that they might of themſelues bee able to inuert the order of the Vniuerſe, and ouer-whelme the whole Earth, which hee gaue man for his habitation. But this reaſon is thought very weake, for as much as it ſeemeth to imply a new creation: The conceit of a new Creation is pronounced by a learned Countreyman of ours, both vnlearned and fooliſh: for whereas it is written (ſaith hee) that the fountaines of the deepe were broken open, it cannot otherwiſe be vnderſtood, then that the waters forſooke the very bowels of the Earth, and all whatſoeuer therein was diſperſed made an eruption through the face of the Earth. Now if wee compare the height of the waters in this deluge aboue the higheſt mountaines, being onely 15 cubits, with the depth of the ſemi-diameter of the Earth to the Center, we ſhall not find it impoſſible, anſwering reaſon with reaſon, that all theſe waters diſperſed vnder the Earth, ſhould ſo far extend as to drowne the whole Earth: for the ſemi-diameter of the Earth (as *Aſtronomers* teach) is not aboue 35:9

miles, wherein the waters contained and diſperſed, may bee ſufficient for the hight of the greateſt mountaines, which neuer attaine 30 miles vpright: whereas this diſtance of 30 miles is found in the depth of the Earth 116 times. Secondly, the extenſion of the Ayre being exceeding great, it might pleaſe God to condenſate and thicken a great part thereof, which might concurre to this Inundation. We willingly aſſent to the worthy Authour, that this Inundation might bee performed without any new creation: Notwithſtanding we cannot hence collect that it was Naturall. But to compoſe the difference the better, and to ſhew how far Nature had a hand in this admirable effect, we will thus diſtinguiſh; that an effect may be called Naturall two manner of wayes: Firſt, in regard of the cauſes themſelues: Secondly in reſpect of the Direction and Application of the cauſes. If we conſider the meere ſecondary and inſtrumentall cauſes, wee might call this effect Naturall, becauſe it was partly performed by their helpe and concurrence. But if we conſider the mutuall application and coniunction of theſe ſecond cauſes together with the firſt cauſe, which extraordinarily ſet them aworke, we muſt needs acknowledge it to be ſupernaturall. For other particular Inundations in particular Regions we may more ſafely terme them Naturall, as directed and ſtirred vp by ſecond cauſes, working no otherwiſe, then according to their owne naturall diſpoſition. Two cauſes concurring together, are here moſt notable, whereof the firſt is the great coniunction of watry Planets working on the water their proper ſubiect: the other the weaknes of the bounds and banks reſtraining the water, which by proceſſe of time weare out and ſuffer breaches: both theſe cauſes ſometimes concurring together, cauſe an Inundation: which aſſertion wee may lawfully accept, but with this caution, that Almighty God working by ſecond cauſes, neuertheleſſe directs them oftentimes to ſupernaturall and extraordinary ends.

2 *Particular alterations haue happened to Bounds of Regions by Particular Inundations.*

How-

How ſoeuer ſome inundation haue not continued long, but after a ſmall time left the Earth to her owne poſſeſſion; yet others haue been of ſuch violence, as they haue beene found to haue fretted away, or added, and ſo altered the bounds and limits of places: which beſides diuerſe examples produced by vs, in our former chapter. *Ariſtotle* ſeemes to acknowledge in the 1 booke of his *Meteors*, the 14 Chapter, where he ſaith, that by ſuch Accidents ſometimes the *Continent* and firme land is turned into the Sea, and other-where the Sea hath reſigned places to the Land: for ſith the agitation or mouing of the water depends ordinarily vpon the vertue of Heauenly bodyes, if it ſhould happen that thoſe Starres ſhould meet in coniunction, which are moſt forceable and effectuall for ſtirring vp of Tempeſts and Flouds, the Sea is knowne to rage beyond meaſure, either leauing her ancient bounds, or elſe vſurping new. By this meanes (as we haue ſhewed in the former Chapter) ſome Ilands haue been ioyned to the Land, and ſome *Peninſula's* ſeparated from the Land, and made Ilands: ſomewhere the Sea hath beene obſerued for a great ſpace to leaue the Land naked, as *Verſtegan* coniectures of the moſt part of *Belgia*, which hee ſayes, was in ancient time couered with water; which beſides many other arguments hee labours to proue out of the multitude of fiſh-ſhells, and fiſh-bones, found euery-where farre vnder ground about *Holland*, and the coaſts thereabouts, which being digged vp in ſuch abundance, and from ſuch depthes, could not (ſaith hee) proceed from any other cauſe then the Sea, which couered the whole Countrey, and ſtrewed it with fiſhes. Laſtly, that the Sea might ſeeme as well to get as loſe, ſhee hath ſhewed her power in taking away and ſwallowing vp ſome Regions and Cities, which before were extant: Such fortune had *Pyrrha* and *Antiſſa* about *Meotis*, *Helice* and *Bura* before mentioned in the *Corinthian* ſtraites: ſome haue beene of opinion that the whole *Mediterranean* within *Hercules* pillars, was in time paſt *habitable land*, till it gaue way to the violency of the Seas inuaſion: But in this I credit nothing without farther ground. The like vncertainties are alſo related of the *Atlantick Ilands*, greater then all *Africa*, ſwallowed vp of the *Ocean:* which *Columbus* was ſaid in a ſort to haue diſcouered in the Sea, finding a great ſhallow fraught with weedes, where he ſuppoſed this great Iland to haue ſtood. But I rather beleeue that this *Atlanticke* Iland ſpoken of by *Plato*, was either a *Poeticall* fiction, as *Moores Vtopia* with vs, or at leaſt the Continent of *America* perhaps in thoſe dayes obſcurely diſcouered, but the diſcouery loſt againe to after ages.

3 *Certaine Regions by reaſon of great Riuers are ſubiect to certaine* Anniuerſary Inundations, *which commonly happen betwixt the Tropicks in the Summer, without the Tropicks in the Winter.*

The former clauſe is proued by experience almoſt in all great Riuers in the world, which at ſome times of the yeere ſwell higher, ouerflowing their bankes, and drowning a part of the land about them. But this happens not alike in all places; for in Riuers included within the Tropicks, as *Nilus* & *Niger* in *Africa*, and *Oregliana* in *America* with others there-about, this *Anniuerſary* Inundation, is in the Sũmer, elſe-where it is commonly in the *Winter.* For the former theſe cauſes may be aſſigned; 1 The melting of the ſnow on the tops of the great mõtaines in thoſe parts, which is greateſt of all, when the Sun is neereſt or verticall vnto them, which we are to accompt their Summer. 2 The daily raines & ſhowres ſuch Regions are ſubiect vnto; Theſe ſhowres are much more frequent & greater when the Sun is neereſt their verticall point or in it: The reaſon whereof we haue formerly ſhewed to bee this: That the Sun daily in thoſe parts drawes vp more vapours, then he can diſſipate & conſume: Whence meeting with the cold of the middle Region of the *Aire* they are condenſated into drops, & ſo turned into raine. For the later caſe in riuers ſituat without the Tropicks, cõmonly happens the contrary, to wit, that ſuch Inundations happen rather in the winter then in the Summer, whereof theſe reaſons may bee rendred. 1 Becauſe *Raine* and *ſhowres* whereof ſuch ouer-flowing are ingendred in thoſe parts, are more frequent in winter then in the Summer. 2 whereas neere the *Equatour*, the *ſnow* is known to melt with the *Sunne* from the tops of high Mountaines, in other parts it ſeldome or neuer melts at all, (as may bee thought (vnder the *Pole* or thereabouts; or elſe, if it melt, it happens, (as in the temperat Zones we ſee it doth) oftner by raine, then the heat of the Sunne.

4 Next are we to ſpeake of *Earthquakes*: An Earthquake is a ſenſible motion and ſhaking of the parts of the Earth.

Amongſt other remarkeable affections of a place, which are not ſo ordinary, an *Earthquake* hath no ſmall conſideration, being oftentimes a meanes which God vſeth to ſhew ſome great and extraordinary iudgement. But not to ſpend more on this ſubiect then may ſeeme meete for *Geography*, wee will ſhew the *cauſes* and *kindes* of it, by which we may the ſooner come to learne what *Regions* and places of the Earth are moſt ſubiect to this affection, which is neceſſary of a Coſmographer to bee knowne. Concerning the cauſes of it, much diſpute hath been among *Philoſophers*: ſome haue ridiculouſly affirmed, that the Earth is a liuing creature, and ſuppoſe with no leſſe, if not greater abſurdity, that the Earth being in good temper, doth reſt & ſettle quietly according to her naturall diſpoſition: From which temper if ſhe be any way remoued, as if ſhe were ſicke, or pain'd in ſome part, ſhe ſhakes and ſhiuers. The relation of this opinion is a ſufficient confutation. *Thales Mileſius* would haue the Earth as a *ſhippe* to ſwimme on the Waters, which being ſometimes as a veſſell by tempeſts turned on one ſide too much, it takes a great quantity of water, which is the cauſe of *Earthquakes*: But this opinion is a poeticall fiction. Little more probable is the opinion of *Democritus*, that the Earth drinking in raine water more then her cauernes can well containe, the water reuerberated backe is cauſe of ſuch a motion: But who can imagine that drops of raine falling into the Earth can bee reuerberated backe, with ſuch violence to cauſe ſuch an extraordinary motion of the Earth? *Anaximenes Mileſius* was of opinion that the Earth her ſelfe was cauſe of her own motion; for the parts of it being taken out (as it were) and broken, fall downe ſometimes into a great depth, cauſing the vpper face of it to ſhake and tremble; to which opinion alſo *Seneca* ſeemes to ſubſcribe in the ſixt booke of his naturall queſtions the 10 chapter; To which alſo accords the Philoſophicall Poet *Lucretius* in theſe words.

Terra ſuperna tremit magnis concuſſa ruinis,
Subter vbi ingentes ſpeluncas ſubruit ætas,
Quippe cadunt toti montes, magnoq; repentè
Concuſſu latè diſpergunt inde Tremores,
Et meritò; quoniam plauſtris concuſſu tremiſcunt
Tecta viam propter non magno pondere tota.

The vpper Earth ſeaz'd with great ruines ſhakes,
When furrowed age her vaſt ribbes ouertakes.
For mountaines great fall downe, and with the blow
The Tremblings are diſperſed to and fro.
Not without reaſon; when a ſmall-ſiz'd waine
Makes houſes neere the way to ſhake amaine,

This laſt opinion ſeemes to carry more ſhew of probability then the former; neither can any man deny, that ſometimes the Earth in ſome parts, may ſhake by the breaking downe of ſome *ſubterranean* parts, whoſe ſuddain and violent motion may cauſe the reſt being continuate to entertaine the like conuulſion. But yet more generall ſeemes the opinion of *Ariſtotle* who would haue *Earthquakes* to proceed from a *ſpirit* or *vapour* included in the bowells of the Earth, as he teſtifies in the 2 of his *Meteors* the 7 chapter. For this vapour finding no way to paſſe out, is enforced to returne backe; and batred any paſſage out, ſeekes euery corner: and while it labours to breake open ſome place for going forth, it makes a tumultuous motion, which is the *Earth-quake.* Now leaſt it ſhould ſeeme improbable that ſo great a maſſe of Earth ſhould bee moued, and ſhaken, by ſo thinne and rarefied a body as is a fume or vapour; *Ariſtotle* in the ſame place ſhewes the admirable force of Winds as well vpon the *Aire*, as on the bodies of liuing creatures: In the *Aire*; becauſe experience ſhewes that being ſtirred vp by a *Windy vapour* it ſometimes is knowne to moue rockes from one place to another, to plucke vp trees and ſhrubbs by the rootes; and ſometimes to throw downe the ſtrongeſt and moſt ſtately buildings: In *mans body*, becauſe by the ſtirring vp and agitation of the ſpirits, which are the Inſtruments of vitall and animall functions, ſometimes one ſicke man can doe that, which cannot bee performed by many ſtronger and abler men; as it hath beene tried ſometimes, that a *Franticke* man hath broken very ſtrong chaines, wherwith he hath been bound; which many other men could not doe. Neither on the other ſide, can it ſeeme ſtrange, that many and great exhalations, vapours, and ſpirits ſhould be ingendred vnder the Earth; For as much as the Earth is heated many wayes. Many wayes may bee ſpecified whence ſuch fumes ſhould ariſe; as, firſt, from the Sunne and Starres; Secondly, from the ſubterranean fires hid in the bowels of the Earth; Thirdly, in the winter-time by an *Antiperiſtaſis*, the heat collecting it ſelfe downeward to the inner parts of the Earth, which was before in the outward parts of it: The argument by which *Ariſtotle* would confirme this opinion, is drawne as well from the *time*, as from the *places*, wherein Earthquakes vſually happen: from the *time*; becauſe then moſt Earthquakes are obſerued to bee, when moſt *exhalations* are incloſed in the bowels of the Earth; to wit, in the *Spring-time* and the *Autumne*. From the places; becauſe, for the moſt part *ſpongie* and hollow Regions, which may drinke in a greater quantity of exhalations, are commonly moſt ſubiect vnto it: for although many exhalations are dayly incloſed in the wombe of the Earth, yet Earthquakes fall but ſeldome; becauſe the matter is ſeldome ſo ſtrong and violent as to ſhake the Earth: Wherefore ſome *Philoſophers* haue expreſſed three principall wayes which make this *Earth-quake*: firſt, when a great quantity of exhalations is ſuddenly ingendred, which for the greatneſſe of it cannot be contained in ſo little a ſpace: for then being almoſt choked, it ſeekes a way to fly forth: Secondly, when the Earth is condenſated by cold, and driues the exhalation from one place to another, which flying hither and thither, ſhakes and ſtrikes the Earth: Thirdly, when the exhalation, the *cold* compaſſing it round by an *Antiperiſtaſis*, begets heat within it, and ſo is rarified: for ſo being vnable any longer to confine it ſelfe to its former place, it breakes forth, and ſo ſhakes the Earth: We muſt here note by the way, that not onely exhalations are cauſe of the diſtemperature in the Earth, but alſo *ſubterranean fires* and *windes*: all which by ſome are iudged to bee of equall force in this action: for the diuiſion of Earthquakes ſo farre forth as it concernes the difference of *places*, we muſt vnderſtand, that it may be either *Vniuerſall* or *particular*: An *Vniuerſall* Earth-quake is that which ſhakes all the whole Earth in euery part, at leaſt in the vpper face: whereof (I ſuppoſe) no *naturall* cauſe can be giuen, but the *immediate* and miraculous power of God: ſuch an Earthquake happened at the time of our Sauiours Paſſion, whereof *Dydimus* a graue and ancient Writer left record. But that which is ſaid to haue happened in the time of *Valentinian*, mentioned by *Oroſius* in his 7 booke of Hiſtories, & 32 Chapter, is thought by graue Authours to be no *vniuerſall* Earthquake, howſoeuer for the large extent of it, it was thought to be generall. A *particular* Earth-quake is that which is bounded in ſome one or more particular places, which for the cauſes before-alleaged cannot be ſo far extended, becauſe the cauernes and conuexities of the Earth, where ſuch vapours and exhalations are contained, cannot bee ordinarily ſo great as to extend to many Kingdomes and Regions.

1 *Regions extreame cold or extreame hot are not ſo ſubiect to Earth-quakes as places of a*

Middle *temper*.

The reaſon is, becauſe in places extreame *cold*, exhalations are not ſo ſoone ingendred, and in ſo great a quantity as in other parts: on the other ſide in places which are extreame *hot*, the exhalations which are bred, are ſoone conſumed with exceſſe of heat: both which may be confirmed by Inſtances. It is obſerued that in the cold *Northerne* parts (as *Olaus Magnus* writes in his 10 booke and 13 Chapter) Earthquakes are very ſeldome or neuer: ſo it is obſerued by *Pliny* in his 2 booke and 18 Chapter: and *Albertus Magnus* in his 3 booke of *Meteours* tract. 2: That places which are very *hot*, as *Egypt*, are ſeldome troubled with this ſhaking of the Earth: whereas places betwixt both, which are ſeated in a more temperat climate, find it not ſo ſtrange.

1 Hollow *and ſpongie places are more ſubiect to Earth-quakes then* ſolide *and compacted ſoyles.*

We muſt here vnderſtand that *hollow* places are either ſuch as lye open to the Aire, or are hollow onely vnder, and cloſe vpward. The former ſort are not at all ſubiect to the moleſtation of *Earth-quakes*, becauſe the *exhalations* fly out without impediment: but the latter being more apt to ingender and retaine ſuch matter, muſt of neceſſity bee more troubled. This is moſt plainely obſerued in *Phrygia*, *Italia*, *Caria*, *Lydia*, wherein ſuch motions are more frequent. To confirme this a little farther, wee obſerue that *hilly* and mountainous places, ſuffer this violence oftner then other parts; becauſe there moſt commonly cauernes and concauities are more frequent then in plaine countreyes. But here by the way may bee obiected, that *ſandy* and ſlimy countryes are many times more free from Earth-quakes then other places: an inſtance whereof was giuen before in *Ægypt*, wherein neuer any *Earth-quake* (as moſt Authours affirme) or at leaſt but one (as *Seneca*) hath beene obſerued. The reaſon may bee giuen, that *ſandy* places without any ſtrife ſuffer the exhalatiõs to diſperſe themſelues:

that ſlimy places want ſufficient receptacles to entertayne them.

3 Ilands *are more often troubled with Earthquakes then the Continent.*

This haue they found to be true in many *Ilands* of the *Mediterranean* Sea, and others alſo; chiefly in *Cyprus*, *Sicylia*, *Eubœa*, *Tyrus*, *Angria*, *Lippora*, and the *Molucco* Ilands betwixt the *Eaſt* and *Weſt-Indies.* The cauſe ſome would haue to bee the *Antiperiſtaſis* or *circumſtancy* of the waters, which is apt to engender greater ſtore of exhalations in the Earth. But neuertheleſſe that *Ilands* are more ſubiect to *Earth-quakes* then *Continents* I dare affirme no otherwiſe then probable; becauſe ſome places in the Continent ſeeme very much affected, eſpecially in *Europe*, aboue other places, *Conſtantinople* and *Baſilæa* if we credite authors which haue written of this matter; in *Aſia*, *China*, and other Regions adioyning thereunto.

CHAP. XIII.

1 THe *Naturall* Affections of the Land haue hitherto beene declared: Wee are in the next place to treate of the *Ciuill*: Thoſe wee terme *Ciuill* which concerne the *Inhabitants.*

2 An Inhabitant is a man dwelling in a certaine place.

The name of an *Inhabitant* (as we haue before noted) may be taken either *generally* for any liuing creature, reſiding in a certaine place, in which ſenſe *Brute* beaſts may be called *Inhabitants*; which ſignification is only *metaphoricall*: or elſe for a

Reaſonable liuing creature, whoſe abode is ſetled in any place or Region, in which ſenſe we here take it. The conſideration of the *Inhabitants* we haue reſerued for this laſt Treatiſe; following as well the methode of the firſt *creation*, as of *Moſes* in the narration. For God proceeding in the firſt Creation according to the order of Generation, from the more vnperfect to the perfect, created not man before ſuch time as he had furniſhed the Earth with all things agreeable and neceſſary for his vſe; to which alludes the Poet in theſe Verſes.

Sanctius his animal mentiſq; capacius altæ
Deerat adhuc, & quod dominari in cætera poſſit,
Natus homo eſt.-----
More ſacred and of vnderſtanding minde,
A creature wants to gouerne euery kinde;
So man begunne-----

Of the *Nature*, *Proprieties*, *Dignities*, and other accidents of this principall creature, there wants no diſcouery; ſith large volumes are ſtuffed with this theame, and euery man which knowes himſelfe can preuent me in this ſubiect: I will here ſpeake of him ſo farre forth as hee is an *Inhabitant* or dweller on the Earth.

3 In the *Inhabitants* wee are to conſider two things: either the *Originall*, or the *Diſpoſition.*

4 The *Originall* is the off-ſpring whence all Inhabitants tooke their beginning.

Concerning the originall of people of the Earth, wee are to obſerue two things; Firſt, the *Diſtinction* of originall; Secondly, the *manner* of Inuention: For the firſt, wee muſt note that all Inhabitants of the Earth, haue a *three-fold* originall or beginning. The firſt was from the firſt Creation, the ſecond was immediatly after the generall deluge, wherein all the ſeminary of liuing creatures was preſerued in the Arke: The third, is the firſt ſtocke or originall of each ſeuerall Nation: For this laſt, it is a matter which wee cannot here ſo well define,

fine, till wee come to the particular deſcription of each Region, to which it properly belongs. It ſhall bee enough in this generall part, to ſpeake of the two firſt, as far as approued Hiſtory and Obſeruation ſhall direct vs: For the Manner of finding out the originall of Nations, theſe rules are giuen vs by *Bodin* in his ninth chapter of the *methode of Hiſtory*. The firſt is by the teſtimony of approued Authors. The ſecond is by the markes and footſteps of Languages. The third may be drawn from the Limits and knowne bounds and ſituation of Countreyes. This knowledge of the Originall of Nations, hath been a matter of no ſmall importance: For (as *Bodin* obſerues) there is nothing which hath more exerciſed the wits of Writers, or cauſed more ciuill diſcords and ruines of diuerſe commonwealths, then the contention about the firſt originall of nations: which iarres and contentions (as I take it) ſpring from no other ground then the naturall pride in the minds of men, and the affection of Nobility: whereby it often comes to paſſe, that ſuch men as haue riſen to greatnes, by their Wealth, Villanies, or other ſuch like meanes, haue afterwards, to continue and bolſter vp their vſurped dignities, ſought out new pedegrees and Anceſters, to ſet a gloſſe vpon their owne baſe beginnings; a humor in our dayes more affected, then prayſeworthy; not only of priuat perſons, but of whole nations, which run far off to ſeeke out their firſt originall, which with more eaſe and certainty, they might find neerer home. To let paſſe other examples we need goe no farther then the *French* and the *Britanes*, both which labour as much as may be, to deriue their firſt originall from the *Troians*. The firſt from the linage of *Hector*, the other from *Æneas*; as if more glory were to be deriued from *Troian* fugitiues, then from the valiant nation of the ancient *Gauls* and *Germans*, from whom they might deriue a truer and a more certaine deſcent. The conſideration of this antiquity of nations ſo far forth as it concernes our *Geographicall* diſcourſe, reſeruing matters of more ſpecialty to our Speciall part, wee will compriſe in theſe Theoremes.

1 *All Nations had their firſt originall from one ſtocke, whence afterwards they became diuided.*

Wee muſt here vnderſtand (as wee haue before noted) that all Nations haue a threefold originall, the firſt before the vniuerſall deluge, the other ſoone after, the later long after. For the firſt, no doubt can bee made by ſuch as credit the truth of holy Scriptures, but it was from *Adam* the firſt father of mankind: For the laſt, it is doubtfull and various, and therefore cannot well bee handled in generall, before wee come to the deſcription of particular countryes; where we are determined to make a ſearch as neere as can be into their originall: But that which we chiefly here note in the ſecond offſpring of mankind ſoone after the flood: For certaine it is that all mankind was confined to the family of *Noah* in the *Arke*, ſo that their firſt originall muſt be drawne from the *Arke*, and that place where the *Arke* reſted, preſently vpon the falling of the waters: which we ſhall proue to be far Eaſtward. Hence is the manifold arrogancy of many nations well diſcouered; for amongſt the Ancients ſome haue ſo much affected the antiquity of their race, that forgetting their humane condition, they haue deriued their nobility from the Gods. Which humour hath not onely inuaded the minds and affections of fooliſh and ignorant men, but alſo of ſuch as haue ſtood in great opinion & eſtimation of wiſdome and vertue: In ſo much as *Cæſar* in a certaine oration to the people of *Rome*, was not aſhamed to boaſt, that he was deſcended by his Fathers ſide from the Gods, by his mother from Kings: As alſo *Ariſtotle* deriued his offſpring from *Apollo* and *Æſculapius*: which ſtrange affectation was little leſſe in the people of lower and baſer condition, who either being vtterly ignorant of their owne offſpring, or at leaſt diſſembling it, for the hate they bore to ſtrangers haue called themſelues Αυτοχϑονᾶς which is as much to ſay, *as a people bred of the ſame region*, not fetching their deſcent from any other nation: In which ſenſe *Ariſtides* in *Panathenais* giues the greateſt nobility to the *Athenians*; to wit that being borne of the Earth the mother of the Gods, they deriued not their deſcent from any other forraine countrey: and this errour is obſerued not onely amongſt the Ancient, but alſo with the newer writers, to bee ſo common, that *Polydore Virgill* otherwiſe a prudent writer, affirmes the *Britaines* to bee a people taking their originall from the Iland Countreyes and not deriued farther. The like is written by *Athamerus* that the *German* nation being firſt bred in *Germany* owed their originall to no other; Which hee labours to confirme out of *Tacitus*, *Sabellicus*, and *Sepontinus*. But (as *Bodin* ſpeakes ingenuouſly) the ancient might well bee excuſed in this errour: But theſe men are ſubiect to great reprehenſion: 1. Becauſe they being Chriſtians ſeeme to reiect the authority of holy Scriptures, which teſtifie that all mankind was deriued from the ſelfe-ſame originall, being (as wee haue ſaid) all confined in the *Arke* of *Noah*. 2 Becauſe by this meanes, giuing to nations no other originall, then from their owne country, they diſtract and diuide each one from the mutuall loue and ſociety of other Nations. For beſides many other reaſons which moued *Moſes* to write of the *Genealogies* of people, this one ſeemes not the leaſt, that men ſhould vnderſtand themſelues to bee all (as it were) kinne, and deſcended from the ſame originall; then which there is no greater means to conciliate and ioyne mens affections for mutuall amitie and conuerſation. As it is reported of *Diomedes* and *Glaucus* and many others, who being armed to one anothers ruine and ouerthrow, haue beene drawne to breake off their hatred by the meere pretence and ſhew of conſanguinity. But theſe who ſo arrogantly boaſt themſelues to bee Sonnes of the Earth, not beholding to any other countrey for their offspring, ſtriue to breake in ſunder the bonds of ſociety betwixt nations, which Gods Word and the Law of Nations binds vs to obſerue. Hence grow thoſe mortall hatreds and heart-burnings betwixt diuerſe countreyes, as of the *Ægyptians*, againſt the *Hebrewes*, of the *Greekes* againſt the *Latines*, wherein they perſecuted one the other extreamly. Hence came it to paſſe that ſtrangers amongſt the *Romans* were called enemies, as the name of *Welch-men* with the *Germans*

mans ſignifieth as much as a *forrainer*; wherein they ſeeme much to degenerate from the ancient hoſpitality of their Anceſtors, for which they haue been much prayſed. Finally from this one root ſpring thoſe infamous libels caſt out of one Nation againſt another, written by ſuch Fire-brands as delight in nothing more then diſſention; but how much better were it to reconcile all people out of this aſſured ground of conſanguinity, ſith Religion perſwades more to Charity and agreement, then to Faction; and contentions. But this I leaue to the Diuine, whom it more properly concernes.

2 *The firſt inhabitants of the Earth were planted in Paradiſe, and thence tranſlated to the places neere adioyning.*

For the confirmation of this point we need no farther proofe then the authority of God himſelfe, ſpeaking in his Word, whereon all truth is grounded; But of the place of Paradiſe, where we place the firſt habitation, ſundry diſputes haue been amongſt Diuines ſufficiently examined, of late by a iudicious and worthy Writer in his Hiſtory of the World. Which tract being too tedious to inſert, wee will contract as farre as concernes our purpoſe. First therefore it would ſeeme meete that wee examine their opinion, which hold this Hiſtory of Paradiſe to bee a meere Allegory: Of this opinion were *Origen*, *Philo Iudæus*, *Fran. Gregorius* with many others: who by the foure riuers of Paradiſe would haue to be vnderſtood the foure *Cardinall Vertues*: as by the *Tree of knowledge*, *Sapience* or *Wiſdome*: To which opinion alſo S. *Ambroſe* ſeemes to adhere; who would haue that by Paradiſe ſhould bee meant the Soule or mind, by *Adam* the vnderſtanding, by *Eue* the ſenſe, by the *Serpent* delectation, by the reſt of the Trees the vertues of the mind: Againſt the Fathers themſelues I will not inueigh, ſith ſome men ſuppoſe their conceits to be rather alluſions, then concluſions. But againſt the opinion it ſelfe, many reaſons may bee drawne to proue there was a true locall Paradiſe Eaſtward: firſt out of the text it ſelfe, which ſaith; *For out of the*

S^r Walter Rawleigh.

ground made the Lord God to grow euery tree pleaſant to the ſight, and good for meats: by the proceſſe of which Story it ſeemes that God firſt created man out of the garden, as it were in the world at large, and then put him in this garden: the end whereof is expreſſed to *dreſſe* and manure it: *Paradiſe* being a garden filled with *plants* and *trees*, pleaſant to behold, and good for meate: which proueth that *Paradiſe* was a *terreſtriall* garden. Secondly, to expreſſe it more plainly, he auerreth that it was watred with a riuer ſpringing out of a Region called *Eden*, being a country neare vnto *Canaan* in *Meſopotania* as *Ezechiel* witneſſeth. Thirdly *Epiphanius* and St *Hierome* vrge to this effect; if *Paradiſe* were ſuch an *Allegory*, then were there no *Riuers*, no place out of which they ſprung, no *Eue*, no *Adam*, and ſo the whole *Hiſtory* ſhould be turned into a meere fable or poëticall fiction. Fourthly, it is proued by continuation of the ſame Story: 1 Becauſe God gaue *Adam* free-will to eate of euery tree of the garden (the foreſaid tree excepted:) beſides he left all the beaſts of the Earth to be named by him, which cannot be meant of imaginary trees and beaſts: for this were to make the whole Creation *ænigmaticall*. 2ly This name is often vſed in holy Scriptures elſe-where as in *Ezech.* 10 *Geneſis* 13.19. which would not haue been ſo, if the whole ſtory had bin meerely *Allegoricall*, & *Paradiſe* an *Vtopia*; ſith the Scripture, ſpecially the hiſtoricall part of them, are written in a plaine ſtile, fitting the capacity of vulgar auditors. Laſtly of this *Paradiſe* planted in the *Eaſt*, wee may find ſome footſteps in prophane Poëts, as in *Homer*, *Orpheus*, *Linus*, *Pindarus*, *Heſiod*, who often ſpeake of *Alcinous* garden, and the *Eliſian* fields: all which deriued their firſt inuention from this deſcription of *Paradiſe*, recorded by *Moſes* in Holy Scripture, whereof the *Heathen* themſelues had ſome obſcure traditions. The ſecond opinion was, that Paradiſe was the whole Earth, and the Ocean the fountain of theſe foure riuers; which was defended heretofore by the *Manichees*, *Nouiomagus*, *Vadianus*, and *Goropius Becanus*. The reaſons which they alleage for their part to proue this aſſertion, were chiefly theſe. 1 Becauſe thoſe things which were in *Scripture* attributed to *Paradiſe*, are generally aſcribed to the whole world, as that place of *Geneſis*; *Bring forth fruit and multiply, fill the earth, and ſubdue it; rule ouer euery creature*. But this argument may eaſily be anſwered: for although the *world* in generall were created for man, and all men deſcended from the ſame originall, to wit, the loynes of *Adam*; yet this diſproueth nothing the particular garden aſſigned to *Adam* to dreſſe, wherein he liued before his tranſgreſſion: for if there had beene no other choyce, but that *Adam* had beene left to the *vniuerſall* (as they imagine,) why ſhould *Moſes* ſay, the garden was Eaſt from *Eden*: ſith the world can not be Eaſt or Weſt but in reſpect of *particular* places? Alſo why was the *Angell* ſet after *Adams* expulſion to barre his re-entrance, if it were not a *particular* place: for according to their opinion *Adam* ſhould be driuen out of the whole World. Their ſecond reaſon is, becauſe it ſemes impoſſible that *Nilus*, *Ganges*, and *Euphrates*, by ſo many portions of the world ſo farre diſtant, ſhould iſſue out of the ſame fountaine. To this we anſwer, that by common *Interpreters* of Scripture, being ignorant of *Geographie*, *Piſon* was falſely taken for *Ganges*, & *Gihon* for *Nilus*: Although it can no way be true that *Ganges* ſhould be taken for a riuer by *Hauilah* in *India*, and *Nilus* ſhould runne through *Æthiopia*, as we ſhall ſhew hereafter. The third opinion is, that Paradiſe is higher then the *Moone*, or higher at leaſt then the Middle Region of the Aire: this opinion is caſt vpon *Beda* and *Rabanus*; to which alſo *Rupertus* ſeemes to accord: who (as it ſeemes) borrowed their opinion from *Plato*, and he from *Socrates*. But theſe two (as it ſeemes) are miſinterpreted, Becauſe by Paradiſe they meant Heauen it ſelfe as many imagine. But to confirme that this terreſtriall Paradiſe is ſuch a place, ſome men produce theſe Arguments. Firſt that it is reported by *Solinus*, that there is a place exceeding delightſome and healthſome on the top of Mount *Athos* called *Acrothones*, which being ſeated about clouds, or raine, or ſuch inconueniences, the people by reaſon of their long liues are called Μακρόβιοι. Secondly they alleage for the hight of this Paradiſe, that *Enoch* was there preſerued from the violence of the flood, as *Iſidore* and *Peter Lombaard* maintaine: But this opinion was of the Diuines condemned in the *Florentine* counſell: and firſt where as they ſay, that ſuch a pleaſant place is in the top of the mountaine *Athos*; this neither proues that this is Paradiſe, neither is it ſo high as they would haue it: For euery high and pleaſant place is not Paradiſe. Secondly, whereas they would haue *Enoch* and *Elias* preſerued in the place, it is expreſſely againſt *Holy Scripture*, which affirmes directly that the waters ouer-flowed all the mountaines, making no ſuch diſtinction. Secondly ſhould wee credit this, we might as well beleiue that certaine Giants ſaued themſelues in that high place, as ſome haue beleiued. Beſides the anſwer of their friuolous arguments, theſe reaſons may bee brought againſt their aſſertion: Firſt, that ſuch a place cannot be commodious to liue in: for being ſo neare the *moon*, it had alſo bin too neare the *ſun*. Secondly, becauſe in this ſort it had bin too neare a neighbour to the Element of *fire*. Thirdly, becauſe (as many hold) the *Aire* in that Region by the motion of the heauens is carried about ſo violently, as nothing there can well conſiſt. Fourthly, becauſe according to *Ptolomy*, the place between the *Earth* and the *Moone* is ſeuenteene times the *Diameter* of the Earth, which make by a groſſe accompt about 120000 miles. Hence it muſt needs follow that Paradiſe being lifted vp to this great hight, muſt haue the compaſſe of the whole Earth for a *baſis* or foundation. But this cannot be imagined: firſt, becauſe it would be ſubiect to the eyes and knowledge of men. Secondly, it would hide the light of the *Sunne* for the firſt part of the day being on the Eaſt ſide. Thirdly it would ouer-poize the *Earth*, and ſo make it to ſhrinke out of his place; one ſide being farre greater and heauier then the other. The fourth conceit is of *Tertullian, Bonauenture*, and *Durandus*, who would haue Paradiſe to bee ſeated vnder the *Æquatour*, becauſe that contrary to the opinion of moſt of all the Ancients, they thought this place to be moſt pleaſant and commodious for habitation. It is true that the places vnder the *Æquinoctial* are not ſo burnt with the Sunne as ſome thought: but, as we haue proued out of latter Nauigators, very pleaſant and fruitfull for the moſt part: yet cannot this be the place of Paradiſe; for asmuch as the Riuers of Paradiſe mentioned in holy Scripture, are not found to meet there: which argument might alſo confute them which thought it was ſeated vnder the *North-pole.* The laſt opinion which I hold the trueſt, is of ſome latter Writers, that Paradiſe was ſeated in a Region South-eaſt from *Meſopotamia*, which is moſt amply and copiouſly proued by S^{r} *Walter Rawleigh*, to whom I referre my Reader: only two reaſons I will alleage. The firſt from the name of *Eden*, ſith there is found an Iland of this name *North-weſt* from the place aſſigned, very fruitfull & pleaſant in all commodities of the Earth, and in later times knowne alſo by the name of *Eden*, which is likely to haue been continued from the beginning. Secondly from the Riuers of Paradiſe, which cannot be imagined to meet in any part of the world: for *Tigris* and *Euphrates* it is certaine that they are found in this very Region: for the other Riuer *Gihon* that it is falſely vnderſtood of a Riuer running through *Æthiopia* is alſo moſt certaine; for ſuch a Riuer could neuer meet with *Euphrates*, which is out of queſtion one of the Riuers of Paradiſe: for asmuch as it is ſo farre diſtāt & diuided from it by the Mediterranean Sea: wherefore I am conſtrained rather to embrace their opinion which interpret *Chus* to be a part of *Arabia*, where *Chuſh* the father of *Noah* ſettled his firſt habitation; which for this cauſe he called after his own name: but afterward in proceſſe of time his poſterity growing exceeding large and populous, they were enforced to paſſe ouer into *Africa*, and ſo ſettle themſelues in *Æthiopia*, which place alſo they called after the ſame name: as wee haue ſeene of later yeares the *Spaniards* at the firſt diſcouery of the *Weſt Indies* called one place *Hiſpaniola*, and another *Hiſpania Noua* in remembrance of their former habitation. But howſoeuer it be, certain it is, that Paradiſe was ſeated in the Eaſt, from whence mankind had it's firſt off-ſpring And probable it is that *Adam* being excluded out of Paradiſe, was caſt into ſome place neare adioyning thereunto, which may alſo from our habitable place of the Weſt, be accounted Eaſtward.

3 *The*

3 *The firſt plantation of Inhabitants immediatly* after *the* Deluge *begunne in the* Eaſt.

As *Adam* the father of all Nations before the flood began his offspring in the *Eaſt*, neere *Paradiſe*, ſo the *ſecond* father of Nations *Noah* in the *Eaſt* firſt beganne to repeople the world, after the deluge: Which beſides the clearer teſtimony of *holy Scripture*, may ſundry waies be demonſtrated: Firſt, becauſe it is moſt certaine, that the Earth beganne firſt to bee peopled, neere the place where the *Arke* reſted, which is the mountaine *Ararat*: Whether this be a mountaine of *Armenia* as the cõmon Interpreters imagine, or the mountain *Caucaſus* betwixt *Scythia* & *India*, as ſome later Writers with greater probabilities haue gueſſed, hath ſuffered a great diſpute; all agree in this that it was *Eaſtward*. I will not be here ouer curious, but refer it to our hiſtoricall part, where we ſhall particularly handle the memorable accidents, of particular places: Enough it is to proue that the firſt plantatiõ after the flood was *Eaſt-ward*: 2ly no ſmall probability is drawne from the *ciuility*, *magnificence*, and *populoſity* of theſe *Eaſterne* nations before others: For it is certaine that many excellent *Arts* haue flouriſhed amongſt thoſe *Eaſterne* people, before euer our *weſterne* climate dreamed of ſuch matters; Amõgſt many other matters, *Artillery* & *Printing* was in vſe amongſt the *Chinois* & *Eaſt-Indies* of ancient time, long before this inuention was known to vs; as the *Portugalls* who haue trauailed thither haue confirmed. To the vſe of gunnes and ordinance, many ſuppoſe *Philoſtratus* to haue alluded, ſpeaking in the life of *Apollonius Tiraneus lib:2.cap:* 14. Where he ſaith that the people dwelling betwixt *Hyphaſis* and *Ganges* vſe not to goe farre to warre, but driue away their enemies with *thunder* and *lightning* ſent downe from *Iupiter*. By which meanes it is ſaid that *Hercules* and *Bacchus* ioyning their forces were there defeated, and that *Hercules* there caſt away his *golden ſhield*. For the other Inuention of letters howſoeuer it were by the *Græcians* aſcribed to *Cadmus*, as the firſt Inuentour, becauſe he was the man that firſt diſcouered it to the *Græcians*; it is moſt certaine that it was as ancient as *Seth*: And that *Printing* firſt came to vs, from this *Eaſterne* part, appeares by *Iohn Guttemberg*, who brought it firſt out of the *Eaſterne* world: Which art *Conradus* being inſtructed in, brought the practiſe thereof to *Rome*, which afterward one *Geſnerus* a *French-man* much bettered and perfected: For howſoeuer amongſt the *Europæans* this inuention ſeemed but newly borne, yet the *Chinois*, had it before either the *Ægyptians* or *Phænicians*: When the *Græcians* had neither knowledg nor *ciuility*: which is witneſſed aboue a hundred yeares gone by the *Spaniards* and *Portugalls*. Farther for the *magnificence* of thoſe nations, an argument may bee drawne from the Hiſtory of *Alexander* the great, who found more ſtately *buildings* and *Cities* in the little kingdome of *Porus* which lay ſide by ſide againſt the *Eaſt-Indies*, then in all his former trauailes: for in *Alexanders* time *learning* & *ciuility* were not ſpread ſo farre *weſt* as *Rome*: Neither did he eſteeme of *Italy* any otherwiſe, then of a *barbarous* and *vnciuill* place: which made him to turne his army rather againſt *Babilon* and the *eaſt*, which ſeemed a farre worthier prize: Moreouer, *Paulus Venetus* ſhewes that letters and diſcipline was firſt borrowed from the *eaſterne* people, without any returne of intereſt. A third reaſon may bee from the extraordinary ſtrength of thoſe *eaſterne* people in moſt ancient times. For it is reported by *Diodorus Siculus* out of *Cleſias* that *Semiramis* the wife of *Ninus*, not many diſcents from *Noah*, brought an army to inuade *India*, of three millions, beſides horſes and waggoners: Neither had *Staurobates* her aduerſary ſmaller multitudes to encounter her: which extraordinary ſtrength and multitude of men could not poſſibly iſſue out of any *Colony*, ſent thither from the weſterne parts: And therefore it muſt needs follow, that they had their firſt *offſpring* and originall in thoſe *eaſterne* parts neere *India*. Sundrie other reaſons might bee alleaged, but theſe I ſuppoſe will ſuffice to fortifie this aſſertion. Then it is manifeſt that the firſt *Plantation* of nations begunne in the *eaſterne* parts of the Earth: But where we ſhall place and define this Eaſterne part, ſeemes a matter of greater difficulty then the other.

ther. Sr *Walter Rawleigh* out of the premiſed arguments would ſeeme to proue, that this firſt plantation was farre eaſt as farre as *India*, neere which, he would haue the *Arke* to reſt, to wit, on the mountaine *Caucaſus* lying betwixt *India* & *Scythia:* Notwithſtanding the authority of the learned Author, I find that the moſt ancient writers haue drawne the original of all nations ſoone after the flood, from the *Caldæans* or at leaſt amongſt all, made them the firſt: For confirmation of which opinion, they vrge many ſtrong arguments: In the firſt place, they vrge the teſtimony of *Moſes* in the 11 of *Geneſis*, where ſpeaking of the firſt aſſembly of people after the flood he relates, that they came from the *Eaſt* into the plains of *Shinaar*, in which place ſtood *Babilon* the chiefe ſeat of the *Caldæans*. To this they adde the teſtimony of *Metaſthenes*, *Herodotus*, *Cteſias*, & *Xenophon:* which haue afterwards bin ſeconded by *Diogenes*, *Laertius*, *Philo*, *Porphyry* in a certaine epiſtle to *Boethus*, *Clemens Alexandrinus in Stromatis*; *Euſebius de Euangelica demonſtratione*, *Theodoretus lib:* 1. *de Græcarum affectionum ouratione*, *Rabbi Moyſes Maymonis filius lib:* 3. *cap.* 30. *Perplexorum:* with almoſt all the Interpreters of the *Hebrewes:* All which with vniforme conſent haue affirmed that *Ciuility*, *Arts* and *ſciences*, deriued their firſt deſcent from the *Caldæans*. Hence they faigne that *Prometheus* being a *Caldæan*, for that he recalled men from a wilde life to a more ciuill conuerſation, and taught the regular motion of the *ſtarrs* and *planets* before vnknowne, ſtole *fire* from *heauen*, and animated *men* formed out of clay, with a *cæleſtiall* ſoule. But aboue all which may be collected in this kind, no ſmall argument may bee drawne from the *markes* and *footeſteppes* of the *Hebrew* and *Chaldy* tongues, which in no mixture of *tongues*, or proceſſe of *time* could euer be aboliſhed: For this, being the firſt of all other *languages*, was preſerued by *Abraham* and his poſterity; And challengeth antiquity before euer the *Latin* or *Græcian* tongues had any memory: in ſo much as all the ancient nations of the world are found in moſt of their originall names of Gods, peoples, Princes, and places to make vſe of the Hebrew or Chaldey tongues, differing onely in dialect, which without manifeſt wreſting and abſurdity, cannot well be deriued from other latter languages. The firſt father of the people of *Europe* was *Iaphet* the ſonne of *Noāh*, according to the ioynt conſent of Hebrewes, Græcians, and Latines: To which alludes the Poet, where he ſaies, *Audax Iapeti genus*. This name יפת or *Iaphet* in Hebrew ſignifieth aſmuch as Dilatation or enlargement: Whereas the Greeke Etymologiſts ridiculouſly draw it from many other originalls: In the like ſort *Tacitus* ignorant of the Hebrew, would haue the people of *Paleſtine* to be called *Iudæi quaſi Idæi*, from the mountaine *Ida* in *Creete*, from which he dreames they were deriued; whereas the word in the Chaldy ſignifies, as much as Prayers. In like manner *Ian* or (according to *Homer*) *Iaon*, ſuppoſed the firſt Author of the *Iones*, would the Græcians deriue from a flower, whereas the word in Hebrew ſignifie, as much as a deceiuer: Whence *Daniel* prophecied of *Alexander* the great, that the King of יון that is *Iaan* or *Iauan* ſhould raigne in *Aſſiria*. Inſtances in this kind are infinite, as of *Danaus*, drawne from דן *Dan* which ſignifies a Iudge, whence comes *Dardanus* which is the ſeat of Iudges: Of *Ianus* from יין *Iaijn* ſignifying wine; in which ſenſe hee is by *Halicharniſſeus* called *Oenotrius*: Of *Achais* which ſignifies *Greece*, *Ægipt* which is ſtreight or narrow *Nimrode Rebellous*. *Ninus* a ſonne, *Niniue* the houſe of *Ninus*, *Solon quaſi Solam* a peace-maker. So *Cadmus* ſuppoſed to bee the father of letters and learning, amongſt the Græcians, ſignifies in the originall, ſo much as an Eaſterne man or an ancient man. Should wee runne any further on this point, wee ſhould bee thought to write a dictionary, for as much as all the ancient names amongſt the Græcians ſpring from the ſame fountaine: Whence that Ægyptian Prieſt had good reaſon to obiect to *Solon*: That the Græcians ſeemed children, becauſe they had nothing ancient amongſt them: But to better purpoſe a Chriſtian obiected to the Græcians that *Moyſes* the Lawgiuer to the Chriſtians was ancienter then all the Græcian Gods; Other reaſons are taken from the Religion of the Hebrewes, out of which ſeeme to be deriued all the famous religions of the Earth; For to let paſſe the Chriſtian, Iewiſh, & Mahometan Religions at this day flouriſhing, all of them challenging great antiquity, and taking a great mixture from the trueſt and ancienteſt Hebrew diſcipline: It is manifeſt that in the Heatheniſh ſuperſtitions themſelues, many footſteppes haue bin diſcouered: which will appeare by diuers Inſtances. Theſe arguments I confeſſe ſeeme very ſtrong, but yet not of ſufficient ſtrength to enforce credulity without other warrant: To ſay peremptorily with M^{r}. *Bodin*, that by the conſent of ancient writers, the Chaldeans are acknowledged the moſt ancient people, is more then I dare to venter: Neither is this opinion ſo ſtrongly fortified with arguments, but Reaſon may ſteppe in to haue a doubtfull aſſault. Their firſt argument drawne from the teſtimony of holy Scriptures in th 11 of *Geneſis*, ſeemes to ſtand on our ſide, altogether againſt them: For whereas it is ſaid, that they came from the eaſt into the plaine of *Shinaar*, it is manifeſt that the *eaſt* was firſt peopled; or elſe how ſhould this people come from the eaſt into theſe plaines of *Shinaar*, to erect the tower of *Babel*? Secondly, whereas they vrge Arts, Ciuility, Magnificence of the *Chaldeans*, wee ſhall find it rather to agree to the people which dwell farther eaſt, as is witneſſed by the former inſtances. And if any obiect that at this day is found the contrary, for as much as we find the *Indian* to be a barbarous blind and ignorant Nation, in reſpect of the *Aſiatickes* and *Europæans*, we anſwere two wayes. 1 Firſt, that we find not by experience the *Eaſt-Indians* to bee ſo altogether deuoide of ciuility, but that wee may obſerue not only amongſt them the footſteppes, but alſo the practiſe of many ingenuous Arts, ſage gouernment, policy, and magnificence, as amongſt the *Chinois* and the large territory of the great *Mogull* 2. It is not hard to imagine, that in ſo large a tract of time, the beſt ſetled common wealthes ſhould be brought to nought, arts, ciuility, magnificence, be forgotten, and the rareſt inuentions bee caſt into obliuion, eſpecially by thoſe two enemies of ciuility, warres and luxury; both which hauing the raignes in their own hands, are quickly able to aboliſh all wholeſome diſcipline, both in Lawes and Religion. 3. Their argument drawne from the footeſteppes of *Languages* in my ſhallow conceit, proues nothing elſe but that all Lawes, Arts, and Learning was deriued to the *Græcians* from the *Chaldæans*, or the Nations neare adioyning, which formerly receiued it from them. But how farre Learning might propagate it ſelfe the other way towards the Eaſt, is not a matter ſo cleare and out of queſtion. The preſeruation of the Language (for ought I ſee) might grow from the continuance of the Religion, more firmely rooted, and for a long time continued in *Abrahams* poſterity, whoſe abode was ſettled there about, whereas the other farre diuorced, aſwell from their firſt ſpring, as the monumentall ſeales of their religion, quickly turned Religion into Pagan Idolatry: Many reaſons beſides the diſprouing of this former opinion may bee alleaged to proue the *Eaſterne* part of the world to haue bin firſt peopled: amongſt which I will only cull out this one, grounded on the text of holy *Scripture*. It is warranted out of the text: 1 That when the waters began to decreaſe vpon the face of the earth, and the *Arke* began to reſt vpon the mountaine *Ararat*, *Noah* ſent out a doue to make tryall, who returned with an oliue-branch in her mouth. 2 That neare the place he iſſued out of the Arke with all his family, he planted a vineyard, and was drunke with the iuyce of the *Grape*, not knowing the ſtrength thereof: out of which by all probable coniecture muſt needes bee collected, that the Regions neare the place where the Arke firſt reſted, by the benefit of Nature afforded both Vines and Oliues: for we cannot imagine the ſilly *Doue* at the time of the flood empty gorged to haue flowne very farre ouer the face of the waters to obtaine this Oliue branch, nor *Noah* after the flood to haue gone very farre to ſeeke out a conuenient place for his Vineyard: whence it is moſt likely that the Arke reſted in ſuch a place, whoſe neare adjoining Regions are inriched with ſuch commodities. But this cannot bee verified of *Armenia*, wherein for ought my reading informes me, are found neither Vines nor Oliues, whereas ſome places Eaſtward, whereon the Arke according to this other opinion was ſuppoſed to reſt, afford both in great plenty. To vmpire betwixt theſe two opinions, I leaue to my frendly Readers; becauſe it is not in our power to command, but obey Reaſon.

CHAP. XIV.

1 OF the *originall* of Inhabitants of the Earth we haue ſpoken: It remaines wee now treat of their naturall Diſpoſition.

There is nothing more ſubiect to admiration, then the diuerſity of naturall Diſpoſitions in Nations; a matter euident to the eye of obſeruation, and needing no proofe or demonſtration: for who obſerues not in all Nations certaine naturall or nationall vertues or vices, which neither time nor Lawes could euer change or correct. For not to roue farther off then our neighbouring Nations Confines; what Writer in this kind almoſt, were he not very partiall, hath not taxed pride and ambition in the *Spaniard*; leuity, or rather (as *Bodin* would haue it) temerity in the *French*; dangerous diſſimulation in the *Italian*; Drunkenneſſe in the *Dutch*; Falſhood in the *Iriſh*; and gluttony in the *Engliſh*? And howſoeuer many meanes haue bin put in practiſe, either by the ſeuerity of lawes to curb ſuch enormities, or the ſubtilty of diſcourſe to ſhroud theſe vices vnder the name of vertues: yet theſe markes are found to ſtick as cloſe as the ſpots vnto the Leopard, as neither altering their priſtine hue, or yeelding to time or ſtatutes: And if it happened at any time that by extraordinary violence ſome litle alteration were wrought, yet ſome few yeares would find it returne againe vnto his owne nature and diſpoſition. This variety of diſpoſitions being very many, and depending on ſundry cauſes, to helpe memory, we will reduce into certaine heads, out of which in the generall we may giue a iudgment, leauing the reſt to our ſpeciall Tract. The name of naturall diſpoſition in this place we take in the largeſt ſenſe; ſo farre forth as it comprehends vnder it the Complexion, Manners, Actions, Languages, Lawes, Religion, and Gouernment. All which ſo farre forth as they depend from the places we will ſhew. Neither intend we to handle nicely all theſe ſpecialities, foraſmuch as the Manners, Cuſtomes, Lawes, (and for a great part) the externall rites of Religion depend on the naturall conſtitution of the Inhabitants: ſo that little can bee ſpoken of the naturall conſtitution, but of ſuch actions, effects and markes as ſhew themſelues in their ordinary cuſtomes & manners. Wherefore we ſhall be conſtrained to treat of them together, the one being a great furtherance to the explanation of the other.

2 The naturall diſpoſition of the Inhabitants of the Earth may ſuffer change and diuerſity, either in reſpect of the ſite, or in reſpect of the quality of the ſoile, or in regard of the Inhabitants themſelues.

3 The ſite is the reſpect which one place in poſition beareth to another: Here a Nation is diuided into, 1 The *Northerne* or *Southerne*, 2 The *Eaſterne* or *Weſterne*.

4 The Northerne is placed in the North Hemiſpheare, betwixt the *Æquatour* and the *Artick* Pole; The Southerne on the oppoſite ſide betwixt the *Æquatour* and the *Antarticke* Pole.

Of the Northerne and Southerne Inhabitants wee ſpeake not here reſpectiuely, as in regard of the ſame Hemiſpheare, but abſolutely in regard of the two Hemiſpheares and their

Inhabitants, How theſe 2 Hemiſpheares of North and South are varied in reſpect of the quantity and diſpoſition of the ſoile is deciphered before. What diuerſity ſhal be found in the people or inhabitants ſhall be ſhewed in this Theoreme.

1 *The people of the* Northerne Hemiſpheare *aſwell in riches and magnificence, as vallour, ſcience, and ciuill gouernment, farre ſurpaſſe the people of the* South Hemiſpheare.

The people of the Northerne Hemiſpheare wee vnderſtand to bee the *Europeans*, the *Aſiatickes*, the hithermoſt *Africans* being the greater part the Inhabitants of *America Mexicana*, with the hithermoſt part of *America Peruana* together with the people inhabiting the vnknowne land, lying vnder the Artick pole, with all the Ilands belonging to each of theſe: The people of the Southerne Hemi-ſpheare containe a moity Southward of the *Africans*, the Inhabitants of *America Peruana* for the moſt part: the people of the *Terra Auſtralis incognita* or the ſoutth Indies, with ſome Ilands belonging thereunto. Betwixt theſe two partitions, If we make a compariſon we ſhall find a greater diſparity, then euer any inuention of man could any wayes reduce to any ſhadow of Æquality, or any Trauailers obſeruation could euer ſteppe in to diminiſh. To begin with the riches: It is certaine, that the encreaſe of it in any nation proceeds, either from the benefit of the ſoile or from the skill and diligence of the inhabitants: The benefit of the ſoile either in reſpect of the quantity of the ground, or the quality of the ſoile in this ſoutherne part, we haue at large proued to be farre inferiour to that of the Northerne Hemiſpheare. The diligence of the people we can meaſure no otherwiſe then by their Traffick with forraigne nations, or their good husbandry of their owne commodities. Their traffick with forraine nations, is ſuſpected to be little or nothing at all, in reſpect of the northerne Inhabitants hauing ſmall commerce or knowledge of forreigne nations, and that rather enforced by violence and conqueſts, then any way deſired of them: Whereas ſcarce can be found any nation of the Earth, which cannot by commerce or traffick with forraigne Countries, at leaſt neighbouring confines both ſtrengthen thẽſelues, and draw riches from other nations: Leſſe can be hoped from their homebred induſtrie, which is content with ſufficiency, neuer aiming at farther riches then naturall neceſſity ſeemes to exact, as may appeare by all records and Hiſtories almoſt which haue treated of this matter. If we conſider the *ſtate* & magnificene of either, wee ſhall acknowledge a great difference, as diſdaining all compariſon. The firſt offſpring of all nations owes it ſelfe (as we haue proued) to our Northerne hemiſpheare, which that Almighty Creatour of al things bleſſed with knowledge and ciuill gouernment, before euer this Southerne coaſt was knowne or mentioned. All the acts of the *old* and *new* Teſtament performed on this ſide of the Æquatour, can ſpeake the ſtate and magnificence of theſe nations, leauing the other as yet neglected without memory or Hiſtory. Neither hath the Chriſtian religion, the true ground of all ſettled gouernment euer bin ſo propitious, as to ſmile on theſe miſerable Nations, as yet groaning vnder the ſeruile bonds of groſſe Ignorance and Pagan ſuperſtition. Where ſhall we find in any records or antiquities, any ſtate amongſt them to parallell the foure greater Monarchies of the *Aſſyrians*, *Medes*, and *Perſians*, *Gracians*, and *Romans*, or the later riſen out of their aſhes, whereof this one age can produce no few examples? What place is extant at this day in *Europe*, *Aſia*, the Northern tract of *Africk* or *America* (ſome few Deſerts onely excepted) which haue not been either by knowledge receiued from forraigne Nations, or ſome other meanes in ſome ſort reduced to ciuility? At leaſt to haue embraſed ſome ſetled forme of gouernment: Whereas the Regions dayly diſcouered in the Southerne moity are found moſt barbarous, without lawes, ſciences, or ciuility. Or if any ſuch perfection ſhew it ſelfe amongſt them, it is manifeſt that it is owed altogether to the induſtrie of the Europeans, who with great coſt and trauaile, haue brought them ſuch riches whereof the poore wretches neuer knew the want. Inſteed of ſo many Colonies ſent out of Europe & Aſia into theſe Southerne Regions, no record I ſuppoſe can mention one euer ſent from them vnto vs. Which is an argument of their ignorance and want of traffick. What ſhall I ſpeake of the vallour and proweſſe of the Northerne inhabitants, hauing by the ſword erected ſo many kingdomes, and (as it were) without reſiſtance brought into captiuity thoſe Nations of the South? of Arts and Sciences what can be ſaid, but that the Northerne Inhabitant hath all, and the other in a manner none: For liberall and ingenious ſciences and Schooles and Vniuerſities diſperſed in moſt parts of *Europe* and elſe-where can ſpeake our glory: Which for ought I could euer learne the Southerne Continent, neuer ſaw; and admit they know ſome thing in ſome Mechanicall arts, it is no more then neceſſity requires. Neither in the number and extent of inuention, or curiouſneſſe of workmanſhip anſwearable to that wee find at home. The artes of Printing & Artilery were I ſuppoſe neuer of their acquaintance, except perhaps the later, which I dare ſweare hath had better acquaintance then welcome; as that which neuer ſhewed it ſelfe but to their ruine: No obiection can here take place in this compariſon, except ſome man ſuppoſe the monuments and Trophies of theſe nations, either being very ancient haue miſcarried by time, or elſe being of a newer birth are hid, wanting the light of diſcouery: But this is a meere coniecture wanting ground: For what Antiquity or record could euer ſhew ſo much; as the footeſteps or markes of any ſuch monuments? as for the countries as yet vndiſcouered, no better coniecturall iudgement can be giuen, then by that which is already found: For where all other reaſon and obſeruation is ſilent, I alwaies hold equality the beſt meaſure: Another argument not inferiour to the reſt, is the antiquity of the Northerne nations, which without all queſtion is farre greater then that of the Southerne: Becauſe we cannot imagine any man ſo aduenturous to paſſe into theſe remote quarters, till ſuch times as the places neerer adioyning, growing too populous, conſtrained them to ſeeke out a new habitation; which no man could conceiue to be but in many yeares after the vniuerſall Deluge.

5 Each Hemiſpheare with the Inhabitants therein contained, may againe be diuided according to the *longitude* or *latitude:* according to the *Latitude*, Inhabitants may be called either the extreame or Middle.

6 The extreame inhabitants are either the *Northerne* or *Southerne.* The former in the higher Hemiſpheare. The other are the inhabitants thereunto oppoſite in the other Hemiſpheare.

7 The middle Inhabitants are ſuch as are ſituate in the middle betwixt the Æquator and the Pole in either Hemiſpheare.

The miſtaking of the true limits of North and South in this our Northerne Hemiſpheare, hath cauſed great errour amongſt the Ancients: Inſomuch as *Hippocrates* pronounced the people of the North to be of a leane & dry diſpoſition, of a ſmall and dwarfiſh ſtature; whereas either writers out of a good obſeruation haue found them to be of a tall ſtature, bigboned, & of a moſt able conſtitution in reſpect of thoſe of the South. To compoſe which difference we muſt haue recourſe to that ſub-partition of the Hemiſpheare before mentioned, wherein we allotted of the 90 degrees accompted from the Æquatour to the Pole, 30 for *heat*, 30 for *cold*, & 30 for *temperament*; Whereof the former lyeth Southward to the Æquatour; The ſecond is accompted from the pole: the other is conceiued to lye betwixt both. But becauſe wee find this Mathematicall diuiſion to be too preciſe, to anſwere the obſeruation of Writers in this kinde, we muſt a little alter theſe bounds, that theſe rules may rather ſtoop to *Nature* and obſeruation, then Nature bee ſquared to our owne conceits; yet ſhall wee ſhew in a generality, and for the moſt part, that the naturall diſpoſition of the Inhabitants, ought to be iudged and meaſured according to theſe limits: though not exactly anſwering in preciſe degrees. Wherefore towards the North wee limit theſe (with *Bodin* & other good writers) which lie from the 50th degree Northward to the 70th; in which Tract we ſhall find our *Brittaines*, *Ireland*, *Denmarke*, *Gotland*, the *lower Germany* from *Mœnus* and *Hipanus* to *Scythia* and *Tartary*, which take vp a great part of *Europe* & *Aſia*: on the South we place the moſt Southerly *Spaniards*, the *Sicilians*, *Peloponneſians*, *Cretians*, *Syrians*, *Arabians*, *Perſians*, *Suſians*, *Gedroſians*, *Indians*, *Egyptians*, *Cyrænians*, *Carthaginians*, *Numidians*, *Lybians*, *Moores*, and the Inhabitants of *Florida* in *America*. The middle Region is meant that which lyes iuſt in the middle place betwixt the Tropicke and the Pole; not that which lyes betwixt the Pole and the Line: the reaſon whereof wee haue ſhewed before; becauſe the places vnder the Tropicks are found to bee hotteſt, but vnder the Line more temperate; ſo that our temperate Clime here we place that which beginnes at the 40, and endeth at the 50 degree of latitude: In which Climat be the Northernmoſt *Spaine*, *France*, *Italy*, the *higher Germany* (as farre as the *Maſe*) both *Hungaries*, *Illyria*, both *Myſias*, *Dacia*, *Moldauia*, *Macedon*, *Thrace*, and the better part of *Aſia* the *leſſer*, *Armenia*, *Parthia*, *Sogdiana*, and a great part of the greater *Aſia*: ſo that all the Nations as yet mentioned in hiſtories, and perfectly diſcouered in our Northerne Hemiſpheare are contained betwixt the 30 degrees of latitude and the 60. What to thinke of the Nations dwelling betwixt the two Tropicks, and thoſe which are 60 degrees to the Pole, for want of accurate obſeruation and Hiſtory we can ſet downe no certainty: yet ſo farre as men may iudge by coniecture, we may accompt in the Region betwixt the Tropicks, the 15 degrees from the Tropicke towards the Line, to be of like quality with the 15 degrees without the Tropicke. The Tract in the middle vnder the Equatour, being more temperate, then that of the Tropicks, may be iudged to come neere the temper of the middle Region betwixt the Tropicke and the Line, though perhaps ſomewhat hotter. For the Regions very neere the Poles, leſſe certainty can be collected: yet that litle which we find concerning the nature of theſe Inhabitants we will not omit. According to this partition of our *Northern* Hemiſpheare; we may make iudgment of the other; becauſe where no other cauſe ſhewes it ſelfe, we may wel gueſſe theſe places which are of equall ſite to be of equall diſpoſition, ſo far forth as they reſpect the heauenly operation. All which concerne the naturall diſpoſition of the Inhabitants, wee will reduce to theſe three heads; to wit either 1 the bodily qualities; 2 the mentall Affections, 3 the outward Actions.

1. *The* Extreame *Inhabitants towards either Pole, are in complexion* Hot *and* Moiſt: *Thoſe toward the Equatour* Cold *and* Dry: *thoſe of the middle* indifferent *as partaking of both.*

The confirmation of this propoſition depends on 2 points: the firſt is the Declaration of the *Cauſe* of this diuerſity: the ſecond is the effects and diuerſe tokens which this variety of temper produces, as well in the Accidents of the Body, as the Mind. The cauſe we haue partly before opened, which is the Heat of the Sunne in Climates neerer the Equatour, and the Cold in places farther remote, and ſituate neerer the Pole: whereof the former, working on the Internall heat and moiſture of men and all other liuing creatures liuing in thoſe hot Climats, drawes it out, and conſumes it in ſuch ſort, that little remaines but Cold and Dry Melancholy, as the Seas in the bottome, the other parts being (as it were) euaporated: For by how much more heat any man receiues outwardly from the heat of the Sunne, ſo much more wants he the ſame inwardly; which euery man may ſee confirmed out of ordinary experience; ſince that our naturall heat is far more vigorous in Winter then in Summer, and that our ioints are more operatiue in froſty weather, and then when the *Northwinde* is ſtirring. On the other ſide in the Summer wee commonly obſerue the contrary: we find our ioints lazy and heauy, our Appetites dull, as may alſo bee perceiued in the *Engliſh, Germans*, and *French*, trauailing from the *North* Southerly into *Italy* and *Spaine*; who if they confine not their dyet to a ſparing rate, they commonly are ſurprized by ſurfets: an example we haue of *Philip* Duke of *Auſtria*, liuing in *Spaine* after his *German* faſhion. But on the contrary if a *Spaniard*, who in his owne Country is inured to great Niggardlineſſe, arriue in our *Northerne* Countrey, he commonly proues a better trencher-man then our natiue Inhabitants. And this *Bodin* obſerues to fall out true, not onely in Men, but alſo in beaſts, which driuen towards the *North* waxe fat, and proue well; but towards the *South* they pine away and waxe leane: which may well be confirmed out of *Leo Afer*, who auerres, that almoſt throughout all *Africke* you ſhall find few or no heards of cattle or horſe; few ſheepe, and ſcarce any milke: whereas each mans Table almoſt in *Germany* and *Britanny* can giue a plaine demonſtration of our Countreyes ſtore in this kind. Hence may appeare that as the heat of the Sunne towards the *Equatour*, by drawing out the internall heat and moiſture cauſeth men inwardly to bee left cold and dry; ſo towards the Pole the internall moiſture being preſerued from the Exceſſe of Externall heate, and the internall heat being ſtrengthned and thickned by externall cold, haue left vnto them a complexion of heat and moiſture. The middle Region betwixt both extreames being compounded of both, muſt needes by mixture and participation inioy a middle quality. Beſides this expoſition of the cauſes of this temper wee ſhall obſerue many ſpeciall markes and Inſtances which will diſcouer this variety of diſpoſition. Firſt, it is plaine that heat and moiſture are the two qualities of fecundity. Whence it muſt conſequently follow, thoſe Regions which are moſt populous to bee chiefly endowed with this quality and diſpoſition. Now where ſhall wee of this Hemiſpheare find any Countrey to whom Nature owes a greater increaſe of mankinde, but in the *North* amongſt the *Gothes*, the *Scythians*, the *Scandians*, and *Germans*, by whoſe abundant fertility, vaſt deſarts haue beene cultured and inhabited, ſtately *Cities* haue bin founded, *Colonies* haue bin tranſported and deriued almoſt into all *Europe*? Hence haue *Methodius*, & *P. Diaconus* compared the armies of the *North* to ſwarmes of Bees; and the North is termed by *Olaus Magnus*, the ſtore-houſe of mankind: to wit, from which ſo many ſtrong Nations, as the *Gothes*, the *Gepidæ*, the *Hunnes*, the *Cymbrians*, the *Lumbards*, the *Alani*, the *Burgundians*, the *Normans*, the *Picts*, the *Heruli*, the *Sueuians*, the *Slaui*, the *Switzers* and the *Ruſſians* are not aſhamed to deriue their Anceſtry. But here may bee obiected that the *Southerne* people are much more addicted to *Venerie* then the *Northerne*, which ſeemes an argument of greater *Heat*: But to this I anſwer, that this inſatiate appetite of *Venery* in the *Southerne* people, proceeds not from heat, but from *Choler Aduſt*, and *Melancholy*: which humours carry in them a Salt and ſharpe quality (according to Phyſicians) which ſtirres vp their appetite to *Venery*: which we may plainely obſerue by experience: for no men are more moued by this itching appetite of carnall Copulation, then *Melancholy* men. But howſoeuer this affection is moſt predominant in ſuch men, yet it is hardly ſeconded by performance; which makes Geographers to aſcribe more promptneſſe of generation to the *Northerne* men; although ſenſuall concupiſcence raigne more in the *Southerne* men; which indifferent proportion was without doubt granted to either, by the prouidence of Almighty God, that they who were endowed with a greater ſufficiency, ſhould leſſe affect ſenſuall delights then the reſt, which want that proportion of heat and moiſture. And thoſe of the other ſort ſhould haue their Appetites more raiſed vp to wantonneſſe, without the which their off-ſpring would ſoone fayle. A ſecond argument to proue our aſſertion is the Tall and large ſtature of the Northerne man, which argues both heat and moiſture; whereas the Southerne man is ſmall and dwarfiſh in ſtature, compoſed of weake and feeble Nerues. That the people ſituate towards the Pole in a moderate diſtance, ſurpaſſe in greatneſſe, can be ſhowne not only in this our Hemiſpheare in the *Germans*, *Scythians*, *Belgians*, and others; but alſo in the other by the *Pantagones*, whoſe ſituation Southward anſweres ſomewhat neerely to the hight of *Germany*. That moiſture is a great cauſe of growth, appeares as well by Trees and other vegetalls, which growing in low and mariſh grounds increaſe to a moſt incredible greatneſſe; as of thoſe forementioned on the ſide of *Riuo Negro* in *Peru*, and neere the Lake *Hiarotis* in *India* as by Beaſts. For firſt we find the moiſteſt to bee of greateſt ſtature, which is the reaſon why the great Whales and fiſhes in the ſea grow to ſuch a vaſt quantity. Secondly, ſuch Beaſts as haue hot and moiſt bodies cannot ſo well proſper and liue in thoſe Southerne countreyes; as the horſe which by nature being hot and moiſt, liueth but faintly in *Æthiopia*, yet is of good ſtrength in *Scythia*; Whereas the Aſſe being by nature hot and dry is of great accompt and ſeruice in *Africke*, in *Europe* little reſpected, in *Scythia* cannot liue. Neither is moiſture ſufficient for the growth except it bee ſtirred vp by heat: wherefore we may conclude hence that the Northerne man hath both: Out of the contrary effects, wee may likewiſe collect, that the Southerne man wants this quality. Theſe reaſons indifferently proue theſe qualities to wit, of heat and moiſture, to bee in the Northerne man, and the contrary in the Southerne. Diuerſe other arguments are vrged, ſome to proue the one quality, ſome the other apart. A great argument of heat in the Northerne man may bee his extraordinary drinking: A vice which could neuer bee reformed or corrected by times or ſtatutes. This drowth of theirs ſtirring vp this deſire of drinking, can proceed from no other cauſe then their heat: Whereas the Southerne man is ſeldome taxed of this vice: not becauſe hee is more religiouſly temperat then the Northerne; but rather for the naturall temper of his body, which can neither require or beare ſo much as the Northerne. In ſo much as *Bodin* ſeemes to make a doubt, whether the immoderat drinking of the *Germans* is to bee eſteemed a greater fault, then the niggardly ſparing humour of the *Italian*: ſith both ariſe rather out of nature then education: Another argument of heat in the Northerne man, is the extraordinary ſtrength in reſpect of the Southerne man, which is an apparant demonſtration of heat. Wee find that the bloud of the *Scythian* is full of ſmall ſtrings ſuch as are in the gore of Bulls and Bores, and betokeneth ſtrength: Whereas the bloud of the *African* is thinne, ſuch as is in a Hart or Hare. No leſſe are thoſe reaſons which eſpecially proue the Northerne man to bee endowed with much moiſture. Thirdly wee may much better argue from the Phyſiognomicall accident of the body: wee ſhall find the inhabitants vnder the *Tropickes* to bee exceeding blacke: vnder the *Pole* it ſelfe beyond 60 degrees ſomewhat browne, but from thence about 60 their colour is reddiſh: from thence to 45 degrees whitiſh: about the 30 they beginne to wax yellow; and then ſomewhat enclining to greene: all which proceeds out of the variety of heat and cold: For the Blackneſſe of the *Africans* about the *Tropickes*, wee can aſcribe to no other certaine cauſe, then externall heat, and internall cold, his neceſſary concomitant: neere to which approacheth the yellow and greene colour of the people not farre of; Whereof the former diſcouers *Choller* and *Aduſtion*: the other *melancholy*. And howſoeuer the *brownneſſe* of the people dwelling very neere the *Pole* may come by reaſon of externall cold, which by exceſſe, rather dries vp their moiſture, then ſtrengthens the internall heat: Yet the Red colour of the Inhabitants about 60 degrees is a firme argument of heat: and the white hue of the middle people, an apparant marke of a middle temper. No leſſe may bee collected from the eyes and haires of theſe three Nations. The eyes of the *Scythians* are generally tending to a gray colour; The remote haue them of a blew-whitiſh ſhining colour; as the *Cymbrians* and *Danes* according to *Plutarch*; The *Britannes*, *Germans*, and *Normans* come neere vnto this colour, but haue them not altogether ſo gray and ſhining but more obſcure. But the Southerne man hath the colour of his eyes much enclining to blacke. Now if wee will beleeue *Ariſtotle* in his Problemes, the gray colour of the eyes is a very great argument of heat; But the blackiſh colour argues the want of heat; Thoſe which dwell in the middle Regions, haue for the moſt part their eyes of a darke-blew, which colour is apparant in the eyes of *Goates*, which as *Pliny* writes are neuer pur-blind or dimme of ſight. Many ſpeciall arguments beſides thoſe before mentioned, are produced to ſhew the *Northerne* man to ſurpaſſe in moiſture, as the other in drouth: The firſt may be taken from their voice, which in the *Scythian*, or *Northerne* man is tending to hoarſenes; but in the *Africans* very ſharp and ſhrill, as in the *Ethiopians*, & *Carthaginians*, and the moſt ſoutherly *Spaniards*. That this difference doth ariſe from the moiſture of the one, and the want of it in the other may as eaſily be perſwaded; becauſe we obſerue women which are moiſter then men, to haue ſharp & ſhriller voices: Alſo that too much moiſture in wood or mettall makes the ſound of it very hoarſe and harſh; as wee ſee in lead, whereas other mettalls giue a ſhriller ſound: Another reaſon is drawne from their extraordinary ſweating; for it is obſerued, that Northerne men trauailing towards the *South*, or warring in hotter Countreyes, are like to faint and periſh through extraordinary ſweating, as *Plutarch* in the life of *Marius*, records of the moiſt bodies of the *Cimbrians*. Thirdly, it might ſeeme wounderfull which *Tacitus* relates of the *German* nation, that they loue ſloth and yet hate reſt; becauſe (as in Children) the naturall heat prouokes them to Action, but the moiſture procures Softneſſe: whence they muſt either fight or ſleepe. Hence the *Italians* and *Spaniards* make accompt, if they can ſuffer or withſtand the firſt or ſecond aſſault of the *French* or *Germans*, eaſily to vanquiſh them; becauſe as *Marius* and *Cæſar* obſerued of the *French*, that in the firſt aſſault they ſhewed themſelues more then Men, in the ſecond leſſe then Women. A fourth reaſon not inferiour to the reſt may be drawne from the ſoft bodies, of the *Germans*, and *Scythians*, not any way patient of labour, hunger, and thirſt, although very ſtrong and able to giue a ſuddaine encounter or venture on a warlike exploite: The contrary in all ſhall we find in the *Southerne* man; out of which we may well collect, that he enioies a contrary temper: Beſides all which we haue ſaid concerning this aſſertion more ſhall appeare hereafter by theſe ſubſequent Theoremes.

2 *The extreame Inhabitants towards the Poles are more naturally inclined to* Mechanicall *workes and* Martiall *endeauours : the Extreame towards the Equatour to workes of* Religion *and* Contemplation : *the middle to* lawes *and* ciuility.

There are found three kinds of diſcipline, which vſually inuade and occupy the mind and faculties of man : The firſt are *Mechanicall* and externall operations, the which are proiected in the *Intellectuall* part , yet receiue their perfection from the hands and externall organs ; Such as are *Artillery* , making of *Ordinance*; caſting of mettalls, and *Chymicall* inuention ; *Printing* and the like Arts. The ſecond is *Contemplation* , ſeparate & remoued from externall operation. The third as the meane betwixt both , is Ciuill and Morall diſcipline , whoſe act and perfection conſiſts , in the making of *Lawes* , eſtabliſhing and gouerning of States , preſcribing and maintaining of Diuine worſhip, with other matters of the like nature. Theſe gifts it pleaſed God ſo to diſtribute to mankinde , that the former ſhould bee moſt appropriate to the *Northerne* man ; the ſecond to the *Southerne* , the third to the inhabitants of the middle region : in ſuch wiſe as the one ſhould need, and not enuy the others perfection. All which we ſhall demonſtrate firſt out of the cauſes and ground ; Secondly, out of the effects. The cauſes wee haue ſhewed in the former Theoreme , wherein wee haue aſcribed to the *Northerne* man abundance of heat and moiſture in reſpect of the other ; which are the chiefeſt aides of the imagination , on which mechanicall faculties depend ; alſo their plenty of bloud and humours diſtempering their minds: they are, by this meanes leſſe giuen to contemplation. The Southerne men hauing cold and dry braines are of greateſt vnderſtanding in *Contemplatiue* matters , being (as it were) by reaſon of *melancholy* abſtract from externall operation. The middle temper of the braine and humours muſt needs be the mother of a middle diſcipline, which is found to be that which concernes *Manners*, *Lawes*, and *Religion*. Here ſome haue gone about to reduce theſe three kinds of people to three planets anſwerable to theſe 3 diſpoſitions. Ouer the Southerne people they ſet *Saturne*: the Northerne they commit to the gouernment of *Mars*; the middle inhabitants to *Iupiter*. The power of *Saturne* according to the *Chaldeans* conſiſts in *Contemplation*; of *Iupiter* in *practicall action*; of *Mars* in *Artificiall operation*. Which 3 properties may be well gathered out of the *Hebrew* tongue, natures beſt interpreter; for *Saturne* they call שהתא which is as much to ſay as quiet; becauſe nothing better befits the nature of contemplation then retired quietneſſe: *Iupiter* they call צרך which is as much to ſay as *Iuſt*: Which the *Grecians* hauing receiued from theſe *Hebrewes*, they fained *Iupiter* to bee the God of Iuſtice. *Mars* they called מארים which ſignifieth ſtrong or puiſſant, for which cauſe the *Chaldeans* and the *Grecians* would haue *Mars* the God of warre. To *Saturne* they aſcribe cold, to *Mars* heat, to *Iupiter* a temperature betwixt both. To the firſt, they impute the inuention of ſciences and ſuch as concernes Contemplation; To the ſecond practicall prudence; To the third Arts and Workemanſhip. Whereof the firſt depends from the Vnderſtanding, the ſecond from practicall diſcourſe, the laſt from the operation of the phantaſie. But to come neerer the matter and deſcend to particulars: wee will firſt beginne with the *Northerne* man whom we ſhall find to be the father of moſt mechanicall Inuentions as of *Gunnes*, *Printing*, the art of *Liquefaction*, *Chimiſtrie* with infinite other excellent Arts. Hence it comes to paſſe that the *Italians* and *Spaniards*, are vſed to ſend ouer for *Britaines* and *Germans*, as for thoſe which are endowed with a heauenly gift in the Inuention of veines of Mettalls vnder the Earth, as alſo for the opening and well ordering of ſuch Mines: Let any man caſt his eyes on *England*, the *Nether-lands*, *Germany*, he ſhall find the Inhabitants generally, either as the Schollers and darlings of *Mars* weilding their ſwords, or as *Pioners leuelling* of mountaines, or as *Ingmers* contriuing the courſe of waters, or hunting in the woods, or plowing in the field, or looking to their flockes on the mountaines, or working in their ſhops, or at leaſt ſet vpon ſome externall worke or other: that their wits (as *Bodin* merily ſpeakes) might ſeeme to bee in their handes. From whence come for the moſt part our ſeuerall ſortes of ſtuffes, our choice workes in wood, mettall, Iuory, our variety of inſtruments, from the *Italian* or *Spaniard?* No truly: they can rather admire then imitate; and better ſet vs the materialls then inuent the workemanſhip, like thoſe diſtreſſed *Iſraelites* which were enforced to runne vnto the *Philiſtines* to haue their ſwords ſharpened. As we aſcribe to thoſe nations of the North this perfection in operatiue and externall faculties; So cannot wee deny the Southerne man his due prerogatiue, which is Religion & Contemplation. For theſe nations being aboue all other affected with melancholy, willingly withdraw themſelues from common ſociety into Deſarts, and remote receptacles, more accommodated to abſtracted meditation: For contemplation (being of the *Hebrewes* tearmed a precious death) hath a ſpeciall force to ſharpen the wits of men, and by ſeparation (as it were) from the dregges of the vulgar, not onely opens vnto him the ſecrets of nature, but giues him wings to flie vp to heauen in ſacred meditation. Whence it cannot ſeeme ſtrange that from theſe parts at firſt proceeded the *Prophets*, *Philoſophers*, *Mathematicians* of great eſtimation. Alſo that almoſt all Religions of any great moment, owe their firſt originall to thoſe parts: we need roue no farther then the *Hebrewes*, *Chaldæans*, *Ægyptians*, *Græcians*, whom wee ſhall find the firſt founders of Diuine and Humane ſciences. Which hiſtoricall obſeruation diſſents not any whit from the iudgement of the Naturaliſts: Becauſe (as *Huartus* obſerues) the true foment of the beſt vnderſtanding, conſiſts in the cold and drye braine incident to melancholy. And *Ariſtotle* obſerues, that beaſts thẽſelues are ſo much the more adiudged to approach the prudencie of man, by how much they partake the quality of cold. An inſtance of which may bee giuen in the *Elephant*, whoſe bloud (according to *Plinys* Teſtimony) is coldeſt of all other Creatures. To this I might adde for an argument.

gument of the religious diſpoſition of the *Southerne* man, what *Leo Afer* writes concerning the vaſt number of Temples in ſome places of *Africke*, as about *Feſſe* & *Morocco*, their ſtrict obſeruation of holy rites, their rigide Eccleſiaſticall cenſure, with ſuch like. What is ſpoken by *Aluarez* of the hill *Amara* in the midſt of *Africke*, of their ſtrange Library. Churches, Pallaces, with other matters of this purpoſe, would ſerue well to my purpoſe, had I the ingenuity to beleeue the Ieſuite. But againſt this may be obiected perchance that the Chriſtian Religion which is the trueſt and only Religion hath no great footing as yet amongſt thoſe *Southerne* Nations. Secondly, that their Churches haue no perfect platforme of Eccleſiaſticall gouernment, as we find in other Churches towards the *Northerne* tract. To the firſt I anſwer; that we here ſpeake of the Inclination of men to Religious exerciſes, ſo far forth as it depends on their naturall diſpoſition, not reſpecting this or that Religion: for to bee informed in the true Religion and reiect all other, depends not any way on the naturall Inclination of men, but on the immediate gift of the Almighty God, which is pleaſed oftentimes to make election of one Nation before the other, to make the one (according to the *Apoſtle*) a *veſſell of honour, the other of diſhonour*. To the ſecond I likewiſe anſwer, that in Religion two things are to be conſidered: Firſt the Religious and deuout Inclination of man to embrace diuine contemplation: Secondly, the well ordering and gouerning of Religious actions, according to Lawes and Statutes pertaining to the externall regiment of the Church. The former onely being granted to the *Southerne* man, wee may aſcribe the perfection of the other to the people of the middle Region, whom we haue pronounced to bee moſt happy in the managing of Ciuill affaires and Politicke gouernment. Now to proue this people to bee beſt endowed with this faculty, many reaſons may bee alleaged; becauſe according to the teſtimony of moſt approued writers, wee haue found Lawes, Manners, Statutes, & the beſt manner of gouerning Common-wealths to haue proceeded from theſe Nations. For Hiſtories will ſhew vs, that the greateſt and beſt empires of the world haue flouriſhed in *Aſia*, *Greece*, *Aſyria*, *Italy*, *France*, *Germany*, which lie betwixt the *Equatour* & the *Pole*, from the 40 to the 50 degrees: And that out of theſe haue alway proceeded the beſt commanders, the moſt prudent States-Men and Law-giuers, the wiſeſt Lawyers, the moſt eloquent Oratours, the warieſt Merchants. Whereas neither *Africa* in the *South* nor *Scythia* in the *North*, could euer boaſt of many Law-giuers or States-Men worthy note; whence *Galen* complaines that *Scythia* neuer brought forth any *Philoſopher* beſides *Anacharſis* of any great credit.

3 *The People of the Extreame Region towards the Poles in Martiall proweſſe haue commonly proued ſtronger then thoſe neere the Equatour: but the middle people more prouident then either in the eſtabliſhment and preſeruation of Commonwealths.*

The grounds of this Propoſition wee haue layd before: for the former clauſe, that the people of the North ſhould proue more puiſſant then theſe of the South, may well bee concluded out of their naturall ſtrength of body, and their courage of the minde: whereof the latter makes them ready to attempt, the other to execute moſt chiualrous deſignes. Neither want there moſt true and pregnant examples in hiſtory to ſecond this principle: for euery man that is indifferently ſeene in hiſtory may obſerue with wonder how the ſtrong Nations of the *Scythians* haue inuaded the *South*, winning from them many *Trophies* and victories: whereas wee ſeldome find any expedition ſet on from the South to the North (except to the loſſe or ruine of the South) worth any memorable relation. To this many would haue theſe threatning prophecies of *Ieremy*, *Ezechiel*, and *Eſay* to allude, which foretold, that *from the North ſhould iſſue warres, troopes of horſemen, and the Ruines of Kingdomes:* This we ſhall obſerue to bee true not only in the generall, but almoſt

moſt in all particular States, which wee ſhall find propagated from the North to the South. The *Aſſyrians* at firſt ouercame the *Chaldæans*; the *Medes* the *Aſſyrians*; the *Perſians* the *Medes*, the *Greekes* the *Perſians*, the *Parthians* the *Greeks*, the *Romans* the *Carthaginians*, the *Gothes* the *Romans*, the *Turkes* the *Arabians*, the *Tartars* the *Turkes*: and howſoeuer the *Romans* by their proweſſe wanne ſomewhat towards the North, yet found they by experience that beyond *Danubius* no great matter was to be expected; for as much as theſe Nations could not be eaſily vanquiſhed, and being ouercome would not away with ſubiection: which (as ſome ſay) was the cauſe that *Traian* hauing built a great Bridge of ſtone ouer the *Danow*, was perſwaded to breake it downe. *Tacitus* expreſſely confeſſeth, that the *Germans* were too hard for the *Romans*; and could not haue beene ouercome by them, but by the aduantage of the weapons and manner of fight; wherein the *Romans* hauing long continued a ciuill Nation, had practiſed themſelues: which he ſecondeth by many inſtances, drawne from ſeuerall conflicts betwixt the *Germans* and the *Romans*, which he might well ſpeake; for as much as himſelfe reports 210 yeeres were ſpent in the conqueſt of *Germany*, and no Nation ſo much troubled them as this; which notwithſtanding when all was paſt, was thought to bee triumphed ouer rather then conquered. It were an infinite taske to write all which *Tacitus* relates of the valour and warlike diſpoſition of the *Germans*, being a Nation louing *reſt*, and hating *Idlenes*, puniſhing cowardice with Death, and reputing it an inexpiable ſhame for a ſubiect to ſee his Prince ſlaine in Battaile, and returne aliue without him. As much or more hee reports from *Iulius Agricola*, then *Proconſul* of *Britany*, of our ancient *Britiſh* Nation whoſe factions and diſſentions amongſt themſelues gaue occaſion to the *Roman* victory, and not the *Roman* valour wherein hee confeſſed them no way to ſtand inferiour. To ſtrengthen this aſſertion, Hiſtory will afford an euidence almoſt in euery corner of the world, wherein wee ſhall find the *North* by ſundry conqueſts to haue preuailed againſt the *South*. In the *Eaſt* parts wee find that *Cingis Can* a Northerne *Tartar* conquered the *Indians:* That the *Tartarians* alſo conquered the *Armenians*; and yet the *Armenians* had ſuch aduantage againſt the Southerne people, that the *Mamalukes* eſteemed a ſtrong Nation in *Ægypt*, were firſt choſen out of *Armenia*. Alſo wee find that the people of *Cathay* ſubdued the *Chinois* and the *Indians*. Wee read alſo, that *Mahomet* a *Saracen Sultan* of *Perſia*, hired certaine Northerne *Scythians*, with whoſe ſtrength hee ouerthrew the *Caliph* of *Babylon*; who dwelt afterwards in *Turcomania*. Neither wants *America* many examples in this kind, and no queſtion but many others haue been drowned in obliuion for want of Hiſtory. We find that the people of the North in this Continent preuailed againſt the South, and conquered *Mexico*, which was afterward ſubdued againe by *Corteſe*; and by later diſcouery of our *Engliſh* nation we are giuen to vnderſtand that the people about *Terra de Laboradore* are a fierce warlike people, in ſo much as rather then they would yeeld themſelues to be taken captiue by our men, they haue been ſeene to make away themſelues. To goe no further then our own countrey, who knowes not how many famous ouerthrowes haue in later Ages beene giuen to the *Spaniards* and the *French*; eſpecially to the later, who haue feared the vtter vndoing of their State: yet neither of theſe two great Kingdomes could euer attempt any thing againſt the *Engliſh* worthy Chronicle or obſeruation: If any man obiect the actions of King *William* the *Conquerour*, wee can anſwer many wayes: firſt that hee wanne the ſoueraignty not meerely by the ſword, but by Agreement and compoſition, challenging a promiſe from King *Edward* the predeceſſour, and being fortified with a ſtrong faction of the nobility of the Realme: and moreouer the malice of the Subiects againſt *Harald* being an vſurping Tyrant, gaue great ſpurres to his victory: wherefore wee cannot iudge this a true Conqueſt: yet hath *England* beene conquered of the *Danes* a more Northerne people, and ſuffered many inconueniences of the *Scots*, but yet were neuer able to conquer them vtterly, or bring them vnder ſubiection; although fewer in number, and neere their Confines. Now for the ſecond clauſe, that the people of the Middle Region are more prouident in preſeruation of Common-wealths is warranted out of the ſame grounds: for to this two things are neceſſary, to wit, *Armes* and *Counſell*: whence they vſed to paint *Pallas* armed, to ſignifie that not only *ſtrength*, but *Counſell* was neceſſary for the eſtabliſhment of Kingdomes. The *Southerne* people (as we haue ſhewed) being altogether addicted to contemplation, haue beene vnable either to defend themſelues, or repell an enemy. On the other ſide the people of the *North* hauing *ſtrength* ſufficient to aſſault, for want of *prudence* and *counſell* could neuer long enioy their Conqueſts, ſo that wee ſhall ſeldome read of any great Empire eſtabliſhed of either. But the middle people hauing ſtrength to ſubdue the *Southerne*, and policy enough to ouercome the ſtrength of the *North*, haue eſtabliſhed many great and famous Empires. Here for an ample example wee may produce the State of the *Roman* Empire, which borrowed Lawes and diſcipline from the *Græcians*, nauticall Sciences from the *Sicilians* and *Punicks*, military diſcipline from their dayly exerciſe: and therefore was it no great wonder, that in ſtate and glory they ſurmounted all other Nations. On the other ſide wee finde many famous victories atchieued by the *Northerne* people, yet could they neuer leaue behind them any large Empire, but as eaſily loſt as wonne their Kingdomes. Thus fared it with the *Gothes*, the *Hunnes*, the *Heruli*, and the *Vandals*, which with ſo many ſtrong Armies inuaded *Europe*, and *Aſia*, who neuertheleſſe for want of Wiſdome and foreſight, could not hold what they got, or ſettle therein any ſtate of long continuance.

4 *The* extreame *Regions in* manners, actions, *and* cuſtomes, *are cleane* oppoſite, *the one to the other. The middle partake of* mixture *of both.*

That the manners of men depend on the naturall complexion and temper, is warranted as well by experience as approued teſtimony of our beſt Philoſophers. For howſoeuer *grace* or *education* may make a change ; yet this is extraordinary , and theſe raines once looſed men eaſily returne to their former diſpoſition : How much the *Northerne* man differs from the *Southerne* in naturall conſtitution, wee haue formerly taught ; out of which wee cannot but conclude , a great diſparity in *manners* and *cuſtomes* : Yet to ſhew a more ſpeciall and euident demonſtration , wee will make a particular enumeration of ſuch affections as are incident to the *Northerne* & *Sotherne* man , & out of the compariſon make our iudgement.

Firſt therefore , it is manifeſt out of ancient and moderne obſeruation , that the *Northerne* man hath beene taxed of too much leuity and inconſtancy : The *Southerne* man contrariwiſe of too much peruerſe ſtubborneſſe , as well in opinion as affection. The reaſon of both wee haue before ſpecified,to bee their naturall complexion : which in the former is inclined to ſanguine,in the later to *Choller Aduſt*,and *melancholy* : whereof the one is the more ſubiect to change or impreſſion , then the other. *Galen* deriuing all vertues from the humours of the body , makes *Choller* the mother of *prudence* , *melancholy* of *conſtancy* , *bloud* of *mirth, fleame* of *manſuetude* : Out of the mixture of which humours , infinite variety ariſeth. And becauſe theſe humours are ſeldome equally , or proportionally combined , and tempered together ; they become the ſources of infinite vices : Which Inequality of temperament is rather found in the extreame regions : And therefore no maruaile if they are obſerued , to haue beene ſubiect to greater vices then thoſe of the middle region : For the mutability and leuity of the *Northerne* Nations , wee can haue no greater argument then the change of religion : It is written of the *Oſtrogothes* and *Viſigothes* , that being expulſed by King *Attila* , they beſought *Valens* that hee would grant them a dwelling place:conditionally promiſing , that they would ſubmit themſelues , as well to the lawes of the Empire, as to the Chriſtian Religion. Which hauing obtained,they fled from their promiſe and perfidiouſly burnt the Emperor aliue. The *Gothes*,as ſoone as they came into *Italy*, embraced the Chriſtian Religion , but ſoone ranne into Arianiſme : The people of *Groenland* according to *Munſters* relation, being of a *wauering* diſpoſition, ſoone lik't the *Chriſtian Religion,* but ſoone relapſed to *Idolatrie.* The *Turkes* being a kind of *Scythians*, aſſoone as they came into *Aſia,* without any great conſtraint, embraced *Mahumetaniſme.* The *Tartars* likewiſe, without any enforcement yeelded firſt to *Chriſtianity*, and ſoone fell backe to the *Arabian* rites. The *Normans* comming into *France* although very rude and barbarous, reiecting *Gentiliſme*, *Paganiſme*, ſubſcribed to the Chriſtians. As ſoone or ſooner the *Iſlanders* fell from *Idolatrie* to the true *Religion.* The *Bohemians* and *Saxons* firſt caſt off the *Roman* yoake; which were ſeconded by all *Saxonie*, the Cities of the *Balticke* ſea, *Denmarke, Norway, Suedia*, *Heluetia*, and *Britanny.* The reuolt of theſe Nations from the *Roman* ſubiection, I cannot tearme *leuity* or *inconſtancy* in their chiefe *leaders* and *teachers*: Being ſuch as vpon long *deliberation* and mature *aduice* attempted that, which they knew to bee moſt conſonant to *truth* and *reaſon*: to whom without doubt God Almighties hand was not wanting. But for the *rude* and *vulgar* people to be ſo ſoone wonne, and turned from one opinion to aonther, without longer deliberation, was argument of a *mutable* diſpoſition: Sith there can bee no greater token of *Inconſtancy* then to make an abſolute change of *Religion* in all points in ſo ſhort a ſpace; whereas the Religions being ſo neerely affined, the one to the other, no man at firſt ſight, out of *reaſon* and *diſcourſe* would embrace or reiect all grounds together, but by degrees: No leſſe argument of *leuity* in thoſe Northerne people, is the diſtraction and diuiſion of them into ſo many *ſorts* and *factions* of *Religion*, as wee find now in *Germany*, *Belgia*, *Polonia,* and elſe-where, which no doubt at firſt proceeded from one or few beginnings. But on the contrary ſide, if wee looke on the *Africans* and *Southerne* people, we ſhall find them as *obſtinate* and *peruerſe* in ſtanding to their owne propoſitions, as ready to tax the *Northerne* people of *leuity* and *Inconſtancy.* For ſuch hath been the ſetled conſtancy of theſe nations, as wel *Africans* as *Aſiaticks*; that no meanes could be inuented to draw them from their opinion; but either *heauenly miracles* or force of armes. Which conſtancy hath beene apparant, not onely in men but alſo in women and children: which made *Antiochus* euen mad when he by all cruelty tortured the ſeuen Sonnes (as wee find in the booke of the *Maccabees*) yet was as farre from turning them from their Ceremony of forbearing the eating of Swines fleſh, that both the mother inuited them, and the Children willingly ſubmitted themſelues to Martyrdome. Againſt this conſtancy *Mahomet*, when neither by fained miracles nor perſwaſion, he ſaw he could preuaile, betooke himſelfe to Armes, for the eſtabliſhment of his diſcipline which otherwiſe hee could no wayes haue brought to paſſe. And it is ſtrange to ſee the Iewes at this day, which being a people diſperſed ouer the face of the whole Earth, groaning vnder the ſeruile yoake of ſubiection, hauing no King, or ſupreame gouernour of their owne, haue ſo obſtinately retained their religion, for theſe three thouſand yeeres. What ſhall I ſpeake of the *Mahumetans* in *Africke* and *Aſia*; of the *Indians*, the *Chinois* and other Southerne people, which hauing once ſetled a platforme of Religious diſcipline, are impregnable againſt all perſuaſion, mainely oppoſing themſelues againſt the grounds of our Religion, hauing not ſo much as the principles of nature to ſupport their owne. To let paſſe the ordinary commerce and trafficke, with Chriſtian nations, which in ſo euident a caſe, might probably beget ſome fruits; the admired Induſtrie of the *Ieſuites*, erecting their Colleges amongſt them, might ſeeme to promiſe greater matters. But as I haue credibly beene enforced, by ſuch as haue trauailed, as well into *Turkie* as *Africke* and *India*, the euent of their labours hath come ſo farre ſhort of expectation, that they haue by their conference rather engendred a worſe opinion of Chriſtianity. Which though ſome may impute probably to their indirect meanes and ſuperſtitious rites, impoſing on the conſcience, what God neuer commanded, but rather forbad: Yet who ſo ſhall obſerue the cunning and ſubtilty of theſe Sophiſters will rather aſcribe it to the peruerſe and ſtubborne diſpoſition of the people, vnapt to receiue any new impreſſion: For elſe, who could imagine they could be ſo powerfull in peruerting and infecting others with their *Roman* ſuperſtition in theſe parts, hauing their conſciences better enformed out of Gods Word, and their vnderſtandings ordinarily better taught, in principles, and euery way more ſtrongly fenced againſt temptation. As theſe Southerne nations alwaies boaſted of their owne Conſtancy as a prime vertue, ſo ceaſed they not to vpbraide the Northerne man with inconſtant leuity. This the *Italians* obiect to the *French* and *Germans* (as wee finde in *Tacitus*.) The *Greekes* heretofore to the *Italians*, the *Cretians* to the *Gracians*, the *Hebrewes* and *Ægyptians* to the *Greekes* and *Cretians*; On the other ſide the other haue ſo much complained of their peruerſe and ſetled ſuperſtitions. For to iudge indifferently of either, they are both vices declining from that golden mediocrity, which wee call Conſtancy. For the defect is leuity, the exceſſe Pertinacy: and as it is very culpable in any man to turne with euery winde; ſo it is as great an indiſcretion, to be ſo wedded to our owne opinions or affections as to turne on no occaſion: Becauſe all things vnder the ſunne are ſubiect to change and alteration: And therefore it is the part of a wiſe man to accommodate himſelfe vnto the obiect, and not in a fond dreame to wreſt all the world to his owne fancy. For a wiſe Sea-man will rather obey the ſtorme then ſeeke his ruine, and when he cannot recouer the port, will turne to any other point for his owne preſeruation. I ſpeake here onely of matters of ſtate and policy, and not of religious actions, otherwiſe then concerne the externall rites and Eccleſiaſticall diſcipline, the moſt part of which, by wiſe men haue been eſteemed no other, then matters indifferent which may admit of change & alteration. But here ſome one might obiect that the *French* of all Nations; haue been generally taxed of lightneſſe and inconſtancy, being notwithſtanding in the middle region, more *North* then the *Africans*, yet more *South* then the *Germans* or *Scythians*; I cannot altogether excuſe them of this Nationall blemiſh, yet with their countreyman *Bodin*, I hold it more fitly tearmed temerity then leuity, being a people very quicke and agill, as well in ſpeech, as action in ſo much as the executions of matters with them many times are paſt, ere the *Spaniard* can enter into conſolation: for as the *Spaniſh* counſell is ouer ſlow, and full of delayes, ſo is the *French* too heady and haſty: and as delay to the one, ſo raſhnes to the other hath proued dangerous. The mediocrity betwixt both being a promptitude or alacrity in effecting matters, is to be eſteemed as a vertue, which we find in the *Italians*, whoſe action is quicke enough, yet commonly grounded on ſufficient deliberation: yet if we compare the two extreames, wee ſhall find the *Spaniſh* delayes to haue ouercome the *French* haſtineſſe, being farre leſſe ſubiect to errour, then the other.

Another difference betwixt the Northerne and Southerne man is diſcouered in the Affection of Anger and Reuenge. The *Northerne* man though quickly moued to anger, and very furious, prouokes his enemy to the open field, and after a little time is quickly pacified, forgetting the iniury. The *Southerne* man contrarywiſe is not ſo quickly inraged, but being once prouoked, purſueth his reuenge by ſecret ſtratagemes, rather then open fury, and will neuer or very hardly be drawne to reconciliation: which baſe and brutiſh diſpoſition ariſeth not ſo much out of their euill education (as ſome haue imagined) as out of melancholy ill tempered. A proofe whereof wee haue in moſt men amongſt vs, of a melancholy diſpoſition, which according to our common prouerbe, threaten danger and hatred implacable: of this diſpoſition were *Aiax* and M. *Coriolanus*, whereof the former for want of reuenge, in a diſtracted fury fell on the heards of cattle: the other would by no meanes be reconciled to his Countreymen, till he ſaw all their Cities in flames. Of the cruelty of the *Africans* many hiſtories haue giuen teſtimonies, eſpecially *Leo Afer*, ſpeaking of the *Carthaginian* diſſention: and with later Writers moſt memorable is the ſtory of miſerable *Mulleaſſes* depoſed of his Crowne, his eyes burnt out, and his face disfigured, tendring his complaint to the Emperour *Charles*. This cruelty hath no leſſe been obſerued in the moſt Southerne *Americans*, with whom it is a cuſtome to bathe their children in the bloud of their ſlaughtered enemies, to drinke their bloud, and banquet with their carcaſes : And if we examine the originall of tortures and ſeuere lawes, we ſhall find them originally deriued from the Southerne people, which the Northerne Man hath ſeldome vſed but vnwillingly in matters of horrible treaſon. And not without good reaſon haue our Lawes taken other courſes for the conuiction of malefactors in caſes of fellony and murther, then the extortion of confeſſion by extreame tortures, a thing common with the *Italian* ; becauſe (as ſome of our Statiſts haue obſerued) our Nation is by nature more apt to confeſſion without torture, and ſo fearefull of torment, that they will more willingly be brought to the blocke or gallowes, then the racke: whereas the Southerne people by their melancholy temper more fearefull of death, and obſtinate in their opinion, will yeeld rather to the greateſt torture then confeſſion.

Thirdly we ſhall find as great a diſparity betwixt the *Northerne* and *Southerne* man in the ſluttiſh careleſneſſe of the one, and the cleanly neatneſſe of the other. *Tacitus* reports of the old *Germans*, that they liued at home in their houſes in ſordide manner, almoſt naked, and that they vſed the ſame roomes as receptacles as well of their beaſts as of themſelues: which cuſtome we ſhall not find much changed amongſt ſome, if we read *Lipſius* ſpeaking of the *Weſtphalians*, or haue ſo much patience elſewhere to make experiment. It is alſo reported that the *Scythians* whenſoeuer they found themſelues oppreſſed on the way, or in the wars by hunger or thirſt, were wont to open a veine vnder their horſes eares, and to ſucke out their bloud, and to banquet with the fleſh, as we read of *Tamerlanes* Army on the like occaſion: but the *Southerne* people are of a neat and cleanly diſpoſition, abhorring all ſordide and vncleanly action, vſing often bathings & waſhings, not only in ſacred and Eccleſiaſticall matters, but alſo in priuate. And therefore no wonder if (as *Xenophon* among the Ancients reports) that amongſt the *Perſians* it were accompted a very vnmannerly thing to ſpit ; or that amongſt the *Abyſſines* (as *Aluarez* writes) it ſhould bee deemed a moſt hainous and flagitious crime, to drop any filth or ſpittle in any of their temples. An argument of this may be their extraordinary affection of neat &

dainty delicates, which (as *Athenæus* relates) is moſt noted in the *Aſiatickes* and *Ægyptians*, by which meanes *M. Anthony* a luxurious ſpend-thrift, finding himſelfe by *Cleopatra* ſurmounted, he ſmiled at his owne ambition in that kinde, and laughed at the *Romans* his owne Nation as ignorant and barbarous. Of the *Perſian Theophraſtus* writes, that by a certaine Law certaine great rewards were promiſed to ſuch men as had inuented any new kindes of Delicates or pleaſures, which is a great argument of the licorous affection of this Nation. A fourth difference may be diſcouered in the conuerſation of the *Northerne* and *Southerne* Man. For the *Scythian* and *Northerne* man is naturally addicted to company and ſociety, as may appeare by the communion of many men in one place in the fields, who amongſt the ancients were tearmed *Nomades*, and are now called *Hordes*; in which manner the *Tartars* liue at this day: alſo it is well knowne how much the *Germans, Brittaines, Danes* are addicted to company, in ſo much as they can hardly liue long without companions. But the *Southerne* man being (as we haue proued) of a melancholy diſpoſition, chuſeth rather to liue ſolitary, and to lurke in woods and deſarts, then amongſt people: Neere to which nature come the *Italians* and *Spaniards*, who affect rather a retired Grauity, then an open Society, and conuerſe but at a diſtance, rather for formality thē friendſhip. 5ly, no leſſe diſparity in the diſpoſition of theſe nations ſhall we find aswel in the Languages they ordinarily vſe, as the kinds of muſicke which they affect: for the former we may generally obſerue in the *Northerne* Languages a rough colliſion of conſonants and aſpirations, as in the *German* and *Bohemian* Tongues. Neither is this obſerued only in their natiue Tongues, but alſo in their vſe of the Latin Tongue, in pronunciation of which they cannot but mixe rough aſpirations; as I haue obſerued oftentimes in the *Northerne Germans*, who commonly pronounce *firum* for *virum*; *fulgus* for *vulgus*, *Pipi* for *bibi*, with diuerſe other of the like nature: as vnable they are on the other ſide to giue any ſoft aſpiration his due ſound, but commonly leaue it out altogether, or pronounce either the *vocales mediæ* for *vocales tenues*, and *aſpiratæ* for *mediæ*, which

proceeds

proceedes altogether from the immoderate ſtrength of heat and force of the ſpirits. But the *Southerne* people contrariwiſe wanting that degree of heat, in their pronunciation abſtaine from theſe hard aſpirations and colliſion of many conſonants together, without vowels to mollify the harſhnes; as we find in the *Greeke*, *Latin*, *Spaniſh*, and *Italian* tongues, which lye neerer to the South. Alſo the *Turkiſh*, *Arabian*, and *Perſian* tongues are by ſuch as are experienced in them, ſayd to bee ſweet and elegant. Alſo it is to bee noted, that as often as the Colonies of the *North* haue inuaded the *South*, although retaining the ſame foote-ſteps and originall, haue notwithſtanding much altered their pronunciation not onely through the mixture and impreſſion of other languages, but alſo through the nature of the place, as wee find the *Gotiſh* tongue of the *Spaniards* to be changed to a ſmoother and ſweeter pronunciation, then that which is retained in *Scythia*. I ſpeake not of the *Latin* mixture, but of the meere *Gotiſh* words, which wee ſhall perceiue mollified with more vowels, and ſet to a ſweeter termination. The like may be obſerued in the *Hebrew* tongue, which (as *Ioſephus Abudachnon*, ſometimes, a Reader in this Vniuerſity obſerued) to the eare ſounded far ſweeter in the *Arabian*, *Turkiſh*, and *Perſian* dialects then its owne originall; not that it is in them more perfect (which were impiety to beleeue) but becauſe men in pronouncing of a language preferring pleaſure before *ſignificancy*, haue mollified it, with ſoft vowels and aſpirations, rather to ſerue the eare then vnderſtanding. No leſſe affectation ſhall wee find of diuerſe ſortes of muſicke, ſorting with diuerſe diſpoſitions. The *Northerne* mans humour conſortes beſt with the *Phrygian* meaſure, a loud and ſtirring harmony. The Sotherne man hauing his ſpirits more mollified affects the *Lydian*: The people of the middle region, are moſt of all delighted with the *Doricke*, a muſicke heretofore vſed in ſacred exerciſes. They who know theſe meaſures exactly, and which is agreeable to this or that mans fancy, will giue a probable gueſſe vnto his naturall diſpoſition. To runne ouer all the differences in manners and cuſtomes of the *Northerne* and *Southerne* nations were a matter infinite; wherefore it ſhall ſuffice to wrap vp all in generall recapitulation. If wee compare the *Northerne* man with the *Southerne*, wee ſhall find the one white and red, the other blacke or tawney; the one big-boned, the other ſmall and dwarfiſh; the one ſtrong, but eaſie to be deceiued; the other weake, but witty and circumſpect: The one giuen much to wine, the other exceeding ſober; the one neglecting both himſelfe and others, the other carefull and ceremonious: The one ruſtically arrogant, the other high minded; the one prodigall, the other parſimonious: The one temperate, the other lecherous; the one a ſlouen, the other neat and handſome; the one plaine and ſimple, the other craftie; the one a Souldier, the other a Prieſt; the one a Workman, the other a Philoſopher; the one ſtanding on the ſtrength of his hands; the other of his wit.

Out of the mixture of theſe extreames, it is no difficult matter to draw the diſpoſition of the middle Nations. For finding the two extreame nations of the *North* and the *South* to be not onely diuerſe, but for the moſt part oppoſite one to the other, in diſpoſition and manners; it were very rationall to iudge the middle to haue a mixture of both, which, obſeruation wee will proue: For if wee compare the middle region with either the extreames, we ſhall find no ſuch apparant diuerſity, as betwixt the extreames themſelues. Here *Monſieur Bodin* dreames of a golden mediocrity to magnifie his owne Countrey, which hee finds in his middle region. For ſithence both theſe extreames challenge an extremitie of diſpoſition, hee imagines this middle tract only reſerued for vertue and temperance. But if hee iuſtly weigh all in the ballance of impartiall iudgement, he ſhall finde no ſuch aduantage. For firſt out of his owne grounds, to which wee haue hitherto aſſented, he aſcribes to the extreame nations an eminency both of vice and vertue: Then cannot the middle challenge theſe qualities otherwiſe then remitted, and of leſſe force. If therefore he would haue their inclination to vice more moderated, and corrected; he muſt alſo confeſſe their diſpoſition to vertuous actions to bee of leſſe validity. Againe theſe middle nations are to bee accompted either directly ſituate betwixt both the extreames, or more inclining to the one then the other: For theſe directly in the middle, wee muſt imagine them to partake of both diſpoſitions, as well to vice as to vertue, borrowing from either extreame as well good as bad. Here therefore can bee found no diſaduantage: For if they will boaſt of the vertues of either, they muſt likewiſe be aſhamed of either vices: If they plead a moderation of the former, they muſt looſe ſo much reputation in the later. For theſe which more neerely incline to the one then the other, it will bee apparant that as they approach the one in one quality, ſo they are farther off in another: as if they approach neerer in contemplatiue wit to the *Southerne* people, ſo will they come ſo farre ſhort of the *Northerne* valour. For by how much more they come neere the vertue of the one, ſo much come they ſhort of the others Affections. The like may bee iudged of their Imperfections; ſo weighing reaſon with reaſon wee ſhall find no ſuch inequality and diſproportion to magnifie the one, or vpbraid the other: for that Almighty Creatour of all things is wont to diſtribute his bleſſings in proportion: and Nature his ſoueraigne hand-maide triumphes in nothing more then variety. Thus haue we ſpoken as farre as hiſtory and obſeruation can iuſtifie, of the lawes, cuſtomes, and manners of the Extreame and middle Nations, in which we haue chiefly tied our diſcourſe to the Northerne and Southerne people in this Hemiſpheare, hauing few hiſtories to leade vs to the conſideration of the other oppoſite on the Southerne Hemiſpheare: yet the cauſes being like, we may out of the former bee able to giue a iudgement of the later.

8. Hitherto haue we treated of the people of the *Northerne* and *Southerne* Hemiſpheares, with the ſpeciall ſubdiuiſion of each into *Extreame* or *middle*: It now remaines that wee ſpeake of the diuiſion of Inhabitants

according to the *Longitude.*

9 According to the *Longitude*, Inhabitants are either in the *Eaſterne* Hemiſpheare, or *Weſterne.* Thoſe I tearme of the *Eaſterne* which liue betwixt the *Canaries* and the *Molucco* Ilands on this ſide: The *Weſterne* thoſe which dwell betwixt thoſe two on the other.

Theſe two Hemiſpheares of the Earth haue by ſome beene called the *Old* and *New-world*; becauſe the former containing *Europe*, *Aſia*, and *Africke*, hath been knowne to the ancients as the portions of *Noahs* three Sonnes, *Shem*, *Ham*, and *Iaphet*, whereof (as the Scriptures teſtifie) *Shem* had *Aſia*, *Iaphet Europa*, and *Ham Africa.* The other containing *America* the *South-continent*, and ſome other *Ilands*, haue beene ſince diſcouered. Of the compariſon of the Inhabitants of theſe two Hemiſpheares we will inſert this Theoreme.

1 *The people of the* Eaſterne *Hemiſpheare in* Science, Religion, Ciuility, Magnificence, *and almoſt euery thing elſe, are farre ſuperiour to the Inhabitants of the* Weſterne.

For demonſtration of this point wee need not ſpend much time; firſt, it is manifeſt that this Hemiſpheare was peopled a long time before the other, which is a probable argument of their culture and ciuility: becauſe all theſe matters haue commonly their growth & perfection with Time, the mother of all perfection. That this part was peopled a long time before the other, is moſt credible: for it is plaine out of the Holy Scriptures, that the firſt off-ſpring of mankind was in *Aſia*; whence it could not diſperſe it ſelfe into *America* and other parts of the Earth, till ſuch time as their populous growth had required larger bounds. The paſſage from *Aſia* into *America* without doubt had been performed either by ſea or land. By Sea it was improbable they ſhould aduenture in that infancy of the World, when the Art of Nauigation was in her ſwathing-bands, and neither the Chart or Compaſſe as yet inuented. If by land they made their paſſage, it was doubtleſſe through the North of *Aſia*, ſuppoſing *America* with *Aſia* to bee one Continent. But this people comming out of a pleaſant and temperate Countrey, would without queſtion firſt attempt the places of the like quality, as moſt pleaſing their eye, and fitting their diſpoſition, before they would inforce their paſſage to the Icy and frozen Climates of the *North*, which can only bee beholding to neceſſity for habitation. Hence without doubt it came to paſſe, that thoſe Nations wandring farre from their firſt fountaine, and leauing no ſufficient monument to inſtruct their poſterity in their firſt originall, came ſhort of the other, as well in reuealed as acquired knowledge: in reuealed knowledge, either ſought in Holy Scriptures, or Traditions, they could not but come ſhort; as being moſt diſtant from the firſt head and fountaine where it was to be found in greateſt perfection. In *Acquired* knowledge gotten by induſtry and experience they could not come ſo farre as the other; becauſe all ſuch knowledge hauing its beginning from obſeruation, and its growth with age, could not bee brought to that perfection amongſt them, who came more lately to bee a people, and ſcarce euer endowed with any ſettled gouernment: but whatſoeuer the cauſes may bee thought of this diuerſity betwixt the people of the *Weſterne* and *Eaſterne* Hemiſpheare, certaine I am that the effect it ſelfe is moſt apparant. Of the happy endowments of *Europe*, *Aſia*, and a good part of *Africke*, both in *Arts liberall* and *mechanicall*, *ſtate*, *policy*, *magnificence*, and *Religion*; we haue often ſpoken, and neede make no repetition. To this if we compare *America*, being (as it were) the only portion of this Hemiſpheare, we ſhall amongſt them find few or no *Arts* either inuented or taught, the vſe of letters ſcarce euer knowne; ſtate and magnificence little regarded, and the

Light of Chriſtian Religion ſcarce euer ſeene ; or at leaſt through the dimme clouds of Roman ſuperſtition. Hee that would know more in this matter, let him read *Peter Martyr*, *Corteſius*, *Acoſta*, and others, of the naturall diſpoſition of the people of *America*.

10 The Inhabitants of ſuch Hemiſpheares are againe ſubdiuided into the *Eaſterne* and *Weſterne* : the *Weſterne* in the *Eaſterne* Hemiſpheare, are they who liue neerer the *Canaries* : the *Eaſterne* are ſuch as are ſituate towards the *Moluccoes* : to which thoſe other in the *Weſterne* Hemiſpeare are correſpondent.

1 *The* Weſterne *people haue been obſerued to be more happy and able in martiall diſcipline : the* Eaſterne *in witty contemplation, and ſpeculatiue Sciences.*

There is no ſmall affinity (as wee haue before touched) betwixt the *Weſt* and the *North*, as betwixt the *Eaſt* and the *South* ; as well in the temperament of the Aire, as the diſpoſition of the Inhabitants : which cognation will appeare more fully by the proofe and demonſtration of this Theoreme. Of the ſtrength and valour of the Weſterne people, many records giue euidence; we read of innumerable Colonies of the *Celtes* a people ſituate on the *Weſt* of *France*, ſent into *Italy*, *Grece*, & *Aſia*. But the *Italians* durſt neuer inuade *France*, till ſuch time as their Empire was at the hight vnder *Cæſar*, taking alſo aduantage of the home-bred enmities of the Inhabitants among themſelues, whence *Tully* the Orator tooke occaſion to praiſe *Cæſar* for ſubduing thoſe Nations, and reducing them to the *Romans* obedience, whoſe ſtrength the *Roman* Empire could hardly ſuſtaine. The *Italians* haue oftentimes moleſted the

Græci-

Gracians, yet from them ſuffered little or ſmall inconuenience; ſo the *Gracians* hauing with their Armes cut out a large way through *Aſia*, ſcarce euer dared to come into *Italy* but once vnder the conduct of *Pyrrhus*, who being almoſt defeated of his Armie, was inforced to ſaue himſelfe by flight. In like ſort *Xerxes* who brought men enough into *Greece* to drye vp the Riuers, was notwithſtanding defeated by a few *Gracians* to his great diſhonour. Wherefore *Cato* had good reaſon to obiect to *Murana*, and *Cæſar* to *Pompey*, that their wars waged againſt the people of *Aſia* in reſpect of others were (as it were) rather againſt Women then Men. This without doubt gaue *Alexander* his greateſt happines and victory, that he turned his Armes againſt the *Eaſterne* people, which were either altogether barbarous, wanting martiall diſcipline, or all ouer delicate, not able to reſiſt ſuch hardnes: whereas if he had oppoſed the *Weſterne* people (by the cenſure of *Liuy*) hee had at leaſt failed of thoſe many Conqueſts, if not purchaſed a fatall ouerthrow. The obſeruation perhaps of which couragious valour in the Weſterne people was the cauſe why the *Turkes* heretofore were wont to chuſe their *Ianiſaries*, and chiefe men of warre out of the *Europæans*, accompting them more ſtrong and able then the *Aſiaticks*, being of temper more ſoft and delicate. To this accords *Iulian* in his booke againſt the Chriſtians: the *Celtes* (ſaith he) are Bold & Aduenturous: the *Greeks* and *Romans* both warlike and ciuill: the *Egyptians* more induſtrious and ſubtile, although weake and tender. The *Syrians* with great alacrity conforme themſelues to diſcipline: And a little after hath theſe words: What ſhall I declare (ſaith hee) how couetous of liberty and impatient of ſeruitude the *Germans* are, how quiet and tractable the *Syrians*, *Perſians*, *Parthians*, and all the Nations ſituate towards the *Eaſt* and *South* parts of the World. *Tacitus* reports, that the *Batauians* lying on the Weſt of *Germany* of all the *Germans* are the ſtrongeſt and moſt valiant: which *Plutarch* alſo confirmes in the life of *Marius*, that the moſt warlike people of all *France* are theſe which are moſt Weſterne. The like opinion had *Cæſar* of the Weſterne Nations: of all the people of *Europe* (ſaith hee) the *Weſterne* people of the *Brittaines* and *Spaniards* are the ſtrongeſt. Now as the *Weſterne* people iuſtly challenge to themſelues this prerogatiue of ſtrength and valour, ſo muſt they yeeld to the *Eaſterne*, that of Religion and contemplation. To let paſſe the *Indians*, which a long time gone, were enriched with knowledge, if we belieue ancient writers; who can deny the *Hebrewes*, *Chaldæans*, *Syrians*, *Ægyptians*, *Arabians*, and others of the *Eaſt* their iuſt trophies of learning and contemplation, which they haue erected to after ages? From theſe fountaines haue the *Greekes* and *Latins* deriued thoſe large ſtreames, wherewith they haue (as it were) watred all *Europe*. It is written, *That there came wiſe men from the Eaſt to worſhip Chriſt*; which muſt needes bee vnderſtood of *Chaldæa* or the places neere adioyning, where the *Magi* or *Wiſemen* were had in great reputation. If any obiect the decay both of *Learning* and *Religion* at this day, in the eaſterne parts of the world; Wee anſwer that this in moſt parts is meerely *Accidentall*, cauſed by the *hoſtile* inuaſion of the *vſurping Turkes*, which profeſſe themſelues to bee vtter enemies to *Learning* and the true *Religion*. To which, wee may adde the ignorance of the Chriſtian Religion in many places, which is the greateſt ground of ſolide knowledge. For amongſt all religions in the world, there is none which giueth more way to learning then the Chriſtian: Whereas ſome others altogether forbid the ſtudie of ſuch matters; yet is not this inclination ſo abſurde in the Eaſterne people, but that euery-where ſome markes and footeſteps will diſcouer their diſpoſition. For in the *Eaſt* ſhall wee find no ſmall number of Chriſtian Churches and Monaſteries, profeſſing Chriſtianity and other good learning. But to ſpeake no more of the Chriſtian Religion, which wee hold rather by Gods ſpeciall grace, then nature: the ſuperſtitious deuotion of theſe heathen nations to their owne falſe religions, is a ſufficient argument of their naturall inclination to religious exerciſes. How obſtinately peruerſe, Ceremonious, and ſuperſtitious the *Indians* are found in Idolatrous Religions, I haue often wondred to heare ſome trauaylers reporte: Of the other Hemiſpheare comprehending

ding *America*, I haue as yet ſmall euidence out of *Hiſtory*, whereon to ground any certainty; all we can ſay ſhall be comprized in this Theoreme.

2 *The eaſterne part of the weſterne Hemiſpheare was peopled before the weſterne.*

This propoſition ſeemes probably warranted, as well by reaſon as authority; for firſt, ſuppoſing as an infallible ground, that the firſt offſpring of all nations was in *Aſia*, towards the *Eaſt*; it muſt needs follow, that to people *America*, there ſhould be a paſſage thereunto out of *Aſia*; becauſe *America* was a long time not inhabited ere it was diſcouered to the *Europæans*. This paſſage then, was either by Sea or Land: Were it by ſea, the firſt part whereat they could arriue was the eaſterne ſide. If wee ſuppoſe it to be by land (as is moſt likely in thoſe ancient times) yet was it moſt probable it ſhould bee on the *North-eaſt* ſide from the *Pole*, becauſe it is found by obſeruation that on the *North-weſt* ſide it is diuided from *Aſia* by ſtreites, then muſt they firſt touch on the Eaſterne part. To this we may adde the experience of the *Caſtilians* and *Portugalls* (who firſt diſcouered this part) who affirme that the people dwelling on that ſide, haue beene obſerued to ſurpaſſe the weſterne by farre in ciuility of manners, knowledge, and ſuch endowments, which may bee an argument of the antiquity of their plantation.

C H A P. XV.

1. THe ſecond diuerſity of diſpoſition of inhabitants ariſeth from the diuerſe nature of the *Soile*: Here fowre diſtinctions of Nations are

remarkeable. 1. Of the inhabitants of the *Mountaines* and *plaine-Countreyes*. 2. Of *mariſh* and *dry*. 3. Of *windy* and *quiet*. 4. Of *ſea-borders* and *Iland*-people.

That mens diſpoſitions are diuerſly varied according to the temper of the ſoile, euery mans owne experience may eaſily enforme him; for to reſerue particular inſtances to their proper places, it is moſt manifeſt that all the vitall operations of the *ſoule* depends as well vpon the *corporeall* and *organicall* parts, as the *ſpirits*; which being diuerſely affected by the qualities of the *Aire*, and *Earth* muſt needes vary and ſuffer a change. Plaine and euident diſparity is found: firſt betwixt two nations ſituate in the ſame *Parallell* or *climate* in reſpect of the heauens. Secondly, betwixt two men borne in ſeuerall *Countreyes* liuing together for ſome time, in the ſame region. Thirdly, of *one* and the *ſelfe-ſame man* liuing at diuerſe times in diuers regions. Fourthly, of a man liuing in the ſame Countrey at diuerſe ſeaſons and times; all which being heretofore demonſtrated will declare vnto vs the great *Sympathy*, and *operation* the *Aire* and his diuerſe qualities, hath with, and on our corporeall *ſpirits* and *organs*. But the temperament of the Aire (as we haue formerly ſhewed) depends on the temperature of the ſoile: whence it muſt needs follow that the naturall diſpoſition of men ſhould bee varied ſomewhat in reſpect of the *ſoyle*. This diſpoſition of the *ſoile* being manifold, wee haue reduced onely to three heads: leauing other curioſities to ſuch, as haue more leaſure: What wee iudge in this, ſhall be declared in theſe Theoremes.

1 Mountaine *people are for the moſt part more* ſtout, warlike *and* generous *then thoſe of* plaine Countreyes: *yet leſſe tractable to* gouernment.

Of the warlike diſpoſition of the *mountaniſts* and their ſtrange *Impatience* to *ſubiection*, many Hiſtories giue teſtimony. Geographers repor, that ſetting aſide the people of the *North* (to whom for *ſtrength* and *valour* wee haue giuen the palme,) the Inhabitants of the mountaine *Atlas* are *great* and *ſtrong*, out of whom the Kings of *Numidia* and *Mauritania* in time of warre are wont to leuy their forces. And it is worthy admiration to conſider the mountaine people of *Arabia*, who could neuer be drawne to yeeld to ſubiection, but being fortified not ſomuch by the benefit of the *place* (as ſome might happily imagine) but rather by naturall ſtrength and valour, haue alwaies liued in liberty. To whom (as is reported) the *Turkes* giue a yeerely ſtipend to keepe them off from inuading the Territories of *Palæſtine* and *Damaſcus*. Of the *Marſians* the ancient inhabitants of the *Appenine mountaines* in *Italy*, the *Romans* were wont ſo well to conceiue, that it grew into a prouerbe: *Sine Marſis triumphaſſe neminem. Goſtane*, when he went about to inuade the kingdome of *Suecia*, choſe his legions of ſouldiers, out of the *Dalecarly*, who inhabite the *Succian mountaines*. But amongſt all, no nation hath purchaſed a greater opinion and reputation then the *Heluetians*, liuing amongſt the *Alpes*. Theſe men are *originally* deſcended from the *Succians*, which for *valour*, haue ſo farre approued themſelues, that they haue not onely kept themſelues free from forraigne iuriſdiction, but haue often deliuered their neigbouring countries from ſlauery and oppreſſion. Againſt the houſe *Auſtria* they haue not once diſplaied their banners, and triumphed in their ouerthrow. A great part of *Germany* hath ſmarted vnder their valour; and ſuch an honorable opinion haue they wonne, that they are accompted (as it were) the *Cenſors* and *moderators* to decide controuerſies in matters of *ſtate* and *kingdomes*. *Cicero* giues grrat commendations of ſtrength to the *Ligurgians* inhabiting the *mountaines*: It is well knowne how long and tedious warres the mountaine *Cilicians* and *Acrocerauneans* had with the *Turkes*: how long with ſmall damage they endured affront, and droue them back. Here we might add the examples of the *Biſcanes* and *Cantabrians* in *Spaine*, who vnder

der the conduct of *Pelagius* their King, withſtood the *Saracens*, and preſerued both their *language* and *religion*. The like ought to be ſpoken of the *Welſh* & *Corniſh* people amongſt vs, as of the *Scottiſh Highlander*: all which liuing in *mountanous countries* haue withſtood the violence of forraigners, and for many yeares preſerued their owne liberty. And howſoeuer it may be obiected that the aduantage of the place gaue them courage, yet can wee not deny their diſpoſition due commendation; hauing not only thus for a time protected their owne rights, but made many hoſtile inuaſions on their enemies. Hence *Bodin* would make a certaine *Harmony* betwixt the *mountaine* people, and the *Northerne*, eſteeming the inhabitants of the *Alpes*, the *Pyræneans*, the *Acroceraunij* the inhabitants of *Hæmus*, *Carpathus*, *Olympus*, *Taurus*, *Stella*, *Caucaſus*, *Imaus*, with diuerſe others of the ſame nature, albeit ſituate in the *temperate* part, to bee accompted *northerne* people: as alſo farther towards the *South*, the inhabitants of *Atlas*, of the *Arabian mountaines*, of *Pirus*, and *Seraleona*, are (as it were) by him excepted from the *Southerne* inhabitants, in regard of their *high* and *mountanous ſituation*; which recompenſeth the other, and challengeth asmuch *cold*, as by the heauens it ſhould ſeeme to receiue *heat*. This conceit of a Monſieur *Bodin*, I admit without any great contradiction, were he not ouer peremptorie in ouermuch cenſuring all *mountanous* people of *blockiſhneſſe* and *barbariſme*, againſt the opinion of *Auerroes* a great writer; who finding theſe people neerer *heauen* ſuſpected in them a more heauenly nature. Neither want their many reaſons, drawne from *nature* and *experiment*, to proue *mountanous* people, to bee more pregnant in *wit* and *guifts* of *vnderſtanding* then others, inhabiting *low* and *plaine Countries*. For howſoeuer *wit* and *valour* are many times diuided, as wee haue ſhewed in the *northerne* and *ſoutherne* people, yet were they neuer ſo much at variance, but they would ſometimes meete. Firſt therefore what can ſpeake more, for the witty temper of the *monntaine* people, then their *cleare* and *ſubtile Aire* being farre more purged and rarified, then that in *low* countries: For holding the *vitall ſpirits* to bee the chiefeſt inſtruments in the ſoules operation, no man can deny but they ſympathrize, eſpecially with the *aire* their chiefeſt foment. Euery man may by experience finde his *intellectuall* operations more vigorous in a *cleare* day, and on the contrary moſt dull and heauy when the aire is any way affected with foggy vapours. What wee finde in our ſelues in the ſame place at diuerſe ſeaſons, may we much more expect of places, diuerſely affected in *conſtitution*. A ſecond reaſon for the proofe of our aſſertion, may bee drawne from the *thinne* and *ſpare diet*, in reſpect of thoſe others. For people liuing on *plaines*, haue commonly all commodities in ſuch plenty, that they are much ſubiect to *ſurfeting* and *luxurie*, the greateſt *enemy* and vnderminer of all *intellectuall* operations. For a *fat-belly* commonly begets a *groſſe head*, and a *leane braine*: But want and ſcarcity the mother of frugality, inuites the mountaine dwellers to a more ſparing and wholſome diet. Neither growes this conuenience onely out of the ſcarcity of viandes, but alſo out of the nature of the diet. *Birds*, *Fowles* and *Beaſts*, which are bred vpon *higher* places, are eſteemed of a more cleanely and wholeſome feeding, then others liuing in *fennes* and foggy places: And how farre the quality of our *diet* preuailes in the alteration of our *organs* and *diſpoſitions*; euery naturaliſt will eaſily reſolue vs. A third reaſon may bee drawne from the *cold Aire* of theſe mountanous regions, which by an *Antiperiſtaſis* keepes in, and ſtrengthens the internall heat, the chiefe inſtrument in *naturall* and *vitall* operations. For who perceiues not his vitall, and by conſequence his intellectuall parts, in cold froſty weather to be more ſtrong and vigorous, then in hot and ſoultry ſeaſons, wherein the ſpirits are more diffuſed and weakened. This diſparity in the ſame region, at diuerſe times, in regard of the diſpoſition of the aire, may eaſily declare the diſparity of diuerſe Regions, being in this ſort diuerſely affected. A fourth reaſon may bee taken from the cuſtomary *hardneſſe*, whereunto ſuch people inure themſelues from their infancy; which (as *Huartus* proues) begets a better temper of the braine, in regard of the wit and vnderſtanding; which wee happen to finde cleane otherwiſe with them, who haue accuſtomed themſelues to *delicateneſſe*. Theſe reaſons perhaps would ſeeme onely probable, and of no great moment, were they not ſtrengthened with *forraigne* and *Domeſticke* obſeruation. Haue not the *Heluetians* ſituate amongſt the mountaines, giuen ſufficient teſtimony; eſpecially in the infancy of our *Reformation*? Haue not the *Sueuians* and *Sileſians* ſhewed themſelues able enough, to wipe off the blot of a blockiſh diſpoſition; yet hauing a ſituation wilde and mountainous? Had that great Doctour *Reuclin* iudged well of the nature of ſuch people, hee would not haue made it ſo great a wonder as hee did, that wilde *Sueuia* ſhould produce ſuch learned Men. Forraigne influences elſewhere wherein all hiſtories abound, I forbeare to relate; deſirous rather to bee accompted deficient then tedious. Should I draw home to my natiue *Weſterne* Confines, to which I owe my breath, I ſhould perhaps by ſome be taxed of partiality or affectation. Should I mention our ancient *Brittaines*, inhabiting the Mountainous Countrey of *Wales*, or the greater part of the *Scottiſh* Nation, inioying the like condition of life, and diſpoſition of the Soyle; I might at once winne loue, and ſtirre vp enuy. Neuertheleſſe, as a man by nature borne careleſſe of *Detraction*, yet moſt reſpectiue of *Friendſhip*, I had rather venture my credit, then preiudice the truth: betwixt both which with mee the choice is eaſie. Mine owne Countrey of *Deuon*, which duty commands me to make the firſt Inſtance, I had rather ſet on the ſtage of Enuy, then Diſhonour. I am not of the opinion of the vaine-glorious *Greekes*, who boaſting too much of their owne perfections, eſteemed all Nations elſe *Barbarians*. Yet to checke Mr *Bodins* bold coniecture, out of which hee could finde but one *Anacharſis* in all *Scythia*; I will demonſtrate that our mountainous Prouinces of *Deuon* and *Cornwall*, haue not deſerued ſo ill, as to bee ſo ſharply cenſured for *Blockiſhneſſe* or *Inciuility*. Barren Countries haue been known to nouriſh as good wits, as *Bodin*, *Ariſtippus* the *Philoſopher*, *Callimachus* the *Poet*, *Eratoſthenes* the *Mathematician*, haue not been aſhamed to call *Cyrene* in *E-*

gypt their natiue Country, a Mountainous and Rocky Region. Neither can it bee ſtiled our reproach, but glory, to draw our off-ſpring from ſuch an Aire which produceth wits as eminent as the Mountaines; approaching farre neerer to Heauen in Excellency, then the other in hight tranſcend the Valleyes. Wherein can any Prouince of Great *Brittaine* challenge precedency before vs? Should any deny vs the reputation of *Arts* and *Learning*: the pious Ghoſts of *Iewell*, *Raynolds*, and *Hooker*, would riſe vp in oppoſition; whom the World knowes ſo valiantly to haue diſplayed their Banners in defence of our Church and Religion. Should they exclude vs from the reputation of knowledge in State and Politicke affaires? who hath not acquainted himſelfe with the name of Sr *William Petre* our famous Benefactor, whoſe deſert choſe him chiefe Secretary to three Princes of famous memory? Who hath not known or read of that prodigie of wit and fortune Sr *Walter Raleigh*, a man vnfortunate in nothing elſe but the greatneſſe of his wit and aduancement? whoſe eminent worth was ſuch, both in *Domeſticke Policie*, *Forreigne Expeditions*, and *Diſcoueries*, *Arts* and *Literature*, both *Practicke* and *Contemplatiue*, which might ſeeme at once to conquerre both Example & Imitation. For valour and chiualrous Deſignes by *Sea*, who reades not without admiration the acts of Sr *Francis Drake*, who thought the circuit of this Earthly Globe too little for his generous and magnanimous Ambition? Of Sr *Richard Grenuill*, who vndertaking with ſo great a diſaduantage, ſo ſtrong an Enemy; yet with an vndaunted Spirit made his Honour legible in the wounds of the proud *Spaniard*: and at laſt triumphed more in his owne honourable Death, then the other in his baſe conqueſt? Of Sr *Humfrey Gilbert*, Sr *Richard Hawkins*, *Dauies*, *Frobiſher*, and *Captaine Parker*, with many others of worth, note, & eſtimation, whoſe names liue with the Ocean? In the Catalogue of able and worthy Land-Souldiers, whoſe eye would not at firſt, glance on my Lord *Belfaſt*, who lately deceaſed to the great griefe of his Countrey, becauſe in ſuch a time which moſt requires his aſſiſtance? *Courage*, & *Wiſdome*. which are often at odds, and ſeldome meet, in him ſhooke hands as friends, and challenged an equall ſhare in his perfections. His wiſe managing of his affaires in *Ireland*, ſo well commends his owne *Loyalty*, and his Maſters *choice*, that the whole Realme may truly be ſaid for the moſt part to owe her preſent Peace to his induſtrie. ſhould I ſpeake of Generous *Magnificence* and Fauour of *Learning*, ſhewed by Heroicall Spirits in the generall Munificence extended to our whole Vniuerſity; what Age or Place can giue a Paralell to renowned *Bodley*, whoſe name carries more perſwaſion then the tongue of the wiſeſt Orator? His magnificent Bounty, which ſhewed it ſelfe ſo extraordinarily tranſcendent, aſwell in erection of his Famous *Library*, which he (as another *Ptolomy*) ſo richly furniſht, as other munificent Largeſſes, exhibited to our *Engliſh Athens*, was yet farther crowned by his wiſe *choice*, as proceeding from one, who being both a great *Scholler*, and a prudent *Statiſt*, knew aſwell how to direct as beſtow his liberality. If *Founders* and *Benefactours* of priuate Colledges may find place in this Catalogue of Worthies, the ſweet hiue and receptacle of our *Weſterne* wits can produce in honour of our Country a famous *Stapledon* Biſhop of *Exceſter*, and worthy Founder of *Exon Colledge*: whoſe large bounty was afterward ſeconded (next to *Edm. Stafford* Biſhop of *Sarum*, a *Weſterne* Man) by the pious charge and liberality of M^r *John Peryam*, S^r *John Acland*, & very lately by M^r D^r *Hakewill*, whoſe worthy Encomium, I (though vnwillingly) leaue out, leſt I ſhould ſeeme rather to flatter then commend his Worth. But what needes he my poore mention? His learned works publiſhed to the World, & his Pious Monument beſtowed on our Houſe, ſpeake in ſilence more thē I can vtter out of the higheſt pitch of Inuention. To all which I might adde M^r *Nicholas Wadham*, whoſe liberall hand hauing augmented the number of our Colledges with an abſolute and compleat Foundation, haue left Muſes enough to preſerue his Name vnto eternity. Had I the lik priuiledge to mention the liuing as the dead, we ſhould not finde wanting out of the aſhes of theſe generous *Heroes*, of our *Deuonian* confines, many genuine and worthy Sonnes ſtanding vp in their Fathers places, to ſhew the world a ſucceſſion aſwell of wits as times. There would appeare at once vpon the ſtage our famous D^{r} *Sutcliffe*, the worthy *Dean* of *Exceſter*, whoſe magnanimous endeauours, aſwell in his learned conflicts with our pernicious *Romaniſts*, as in erecting a Colledg to oppoſe our ſworne enemies, the *Ieſuites*, will (no doubt) lengthen out the end of his declining age with Fame and immortality. I could offer to your admiration the Worth and Workes of our renowned *Rector*, D^{r} *Prideaux*, His Maieſties learned Profeſſour of Diuinity in our Vniuerſitie, in whom the Heroicall wits of *Iewell*, *Rainolds*, and *Hooker*, as vnited into one, ſeeme to triumph anew, and threaten a fatall blow to the *Babiloniſh Hierachie*: Inſomuch that hee may iuſtly challenge to himſelfe that glory, which ſometimes *Ouid* ſpeaking of his owne country;

Mantua Virgilium laudet, Verona Catullum,
Romanæ gentis gloria dicar ego.
Mantua Virgill, Verone Catullus praiſe,
I will the glory of the *Romans* rayſe.

Neither want the lawes of our Land, out of this one ſource, ſufficient props to defend their Countries and the Kingdomes right. The admired ſufficiency of *Iuſtice Doddrige*, teſtified to the world by ſo large a report, and expreſſed in his incomparable ſkill in the Lawes (beſides his indowments of Artes and other Learning, ſeconded by the deſerued Fame of M^{r} *William Noy*) can hardly ſcape my pen, being ſo deeply dipped in the midle of my Natiue Countrey. I care not what enuy I ſtirre vp in others, ſo my mother *Exceſter Colledge*, which ſometimes cheriſhed in her boſome theſe two worthy Darlings, and ſince found her curteſie returned back with intereſt, indulgently permit me this liberty.

Beſides theſe choice floures cropt from our *Heſperian* garden, no queſtion but many more would be found out aliue or dead; whom fame, if not iniurious, cannot ſuffer to ſleepe without deſerued memory. I haue hitherto touched ſuch eminent wits and perſons, of whom for their profeſſion ſake the *Church* or *Common-wealth* haue greater reaſon to take eſpeciall notice. Many inferiour faculties are yet left wherein our *Deuon* hath diſplaied her abilities aſwell as in the former, as in *Philoſophers*, *Hiſtorians*, *Oratours* and *Poets*, the blazoning of whom to the life, eſpecially the laſt, I had rather leaue to my worthy friend *M*^{r}*. W. Browne*; who as hee hath already honoured his countrie in his elegant and ſweete *Paſtoralls*, ſo queſtionles will eaſily bee intreated a litle farther to grace it, by drawing out the line of his *Poeticke* Aunceſters, beginning in *Ioſephus Iſcanus*, and ending in *himſelfe*. *Bodin* perhaps might oppoſe againſt vs the eminency of his *Pariſian* territoy, as ſome with vs the glory of our Metropolis and Vniuerſities, diſdaining all compariſon: But to this it is not hard to ſhape an anſwere, 1. That a Metropolis or Vniuerſity is to be imagined as a common receptacle of the moſt ſelected wits deriued rather from other places then the temperament of their owne Aire: Inſomuch as they may be ſaid to owe their abilities, for the moſt part, to thoſe to whom they owe their wealth. Neither can they challenge a greater intereſt in this glory, then our *Townſmen* heere in *Oxford* in the eminent guifts of our choiceſt *Schollers*; beſides, that often happens in our great *Metropolitan* cities by the promiſcuous concurſe of diverſe diſpoſitions; which is reported of the *beaſts* once a yeare comming together to drinke of *Nilus*, of diuerſe ſorts; that by vnnaturall commixture, they yearely beget new monſters: *Africa aliquid ſemper oportat noui*. 2. The ready meanes of *Aduancement* to high and eminent dignityes in *Metropolitan* cityes, which are commonly the ordinary ſeates of Princes, ſets many a braine a worke although *Invita Mineruá*, to ſhew it ſelfe in publike: wherein hee hath the aduantage of *eſtimation* ſooner then *ſufficiency*: wheras many a towardly wit in places farre remote, neuer finds opportunity ſo propitious as to preſent him to popularity. I feare I ſhall be too tedious in this point, recalling to minde that I ſhall find few of my readers in this matter ſo affected as my ſelfe: yet ſhould I not haue ſpunne out this theame ſo long, but to ſtop their mouthes who being ſooner taught to ſpeake then vnderſtand, take aduantage of the rude *language* and plaine *attire* of our countrymen, admiring nothing more then themſelues or the magnificent ſplendour of their owne habitation: As though all the witt in the world were annexed to their owne *ſchoooles*, and no flowres of ſcience could grow in another garden: But a rude *dialect* being more indebted to *Cuſtome* then *Nature*, is a ſmall argument of a *blockiſh* diſpoſition: and a homely outſide may ſhroud more wit then the Silke-wormes induſtrie. I haue ſometimes heard a *rude* ſpeach in a *Frize* habite, expreſſe better ſenſe then at other times a *ſcarlet Robe*: And a plaine Yeoman with a mattocke in his hand ſpeake more to the purpoſe, then ſome Counſellours at the barre: And what other prorogatiue can ſuch men appropriate to themſelues aboue vs, but toyes and formalities, the Idols of *Gulls* and fooles, and the laughter of ſolide vnderſtandings? But now after all this bickering with *M*^{r} *Bodin* to grow to a reconcilement, ere we part, wee will part ſtakes, and in the way of kindneſſe giue him this one diſtinction, which I hope for quietneſſe ſake, he will accept. The naturall diſpoſition of men and their guifts of vnderſtanding and mentall faculties, ariſe either from their *naturall Temper*, or their *Diſcipline* and *education*: For the former I haue ſmall reaſon to giue (as I haue ſaid) the excellencie to the inhabitants of *plaine* and *low Countries*, rather then to the *mountaine* people: But in *diſcipline* and education I muſt confeſſe others commonly to be happier. 1. Becauſe the *Fertility* and increaſe of the Earth inuiting men to ſuch an Habitation, it muſt needes happen that ſuch countries muſt bee more populous, and by conſequence ſettle to themſelues a better forme of *gouernment*, then thoſe which by reaſon of their barren ſoile are more neglected: 2. Becauſe, moſt *Cities* and *Townes*, where are found the chiefeſt meanes of *Inſtitution* of youth, are founded in *plaine Countries* and vallies. This *Perfection* that ſuch regions boaſt of, is owed rather to *Inſtitution* then *Nature*: Hence appeares the reaſon of the laſt clauſe of our Theoreme, to wit, why they ſhould be leſſe tractable to *gouernment*: Becauſe being (as it were) borne to too much *liberty*, they cannot ſo well inure themſelues to *ſubiection*, as other who perhaps know no Condition but ſeruitude of the mountainous people of Wales and *Scotland*, I cannot ſpeake ſo much as I intended: Both becauſe I haue (I feare) tired already my readers patience, as alſo for that,being not ſo conuerſant in their Hiſtories as mine owne, as an ill herald, I may chance to marſhall all amiſſe. Who ſo liſt to reade the courage of our ancient *Britiſh* nation, hee ſhall find enough as well in the *Roman* Story,as our *Engliſh* Chronicles,to ſet them far enough aboue contempt, and place them an eye ſore in the ſight of enuy. But to leaue *Antiquities* & come to theſe times, we may eaſily amongſt many other deſeruing men ſingle out ſome, whoſe eminence ſo obuious to the eye of common obſeruation, is able to daſh *detraction* out of countenance. Who hath not heard not many yeeres ſince of D^{r} *Holland* the Kings Profeſſour in our Vniuerſity, and S^{r} *Roger Williams* a famous Coronell in the *French* and *Belgicke* warres? The Scholaſticall *Learning* of the one, and the *martiall* proweſſe of the other,was too well knowne to require a *Panegyricke*. Neither is *Wales* at this day below her ſelfe, but that ſhe can triumph in two of the moſt Honourable and Generous *Peeres* of this Land, (to whoſe acceptance I owe theſe my poore labours) and the greateſt *Adminiſtratour* of Iuſtice in our Courts: the two former, borne as well to hereditary vertue as greatneſſe: the later aduanced no higher then his owne ability,whom the world knowes beyond my expreſſion.

Scarce had I ſhut vp this tedious diſcourſe,ſpent for the moſt part in defence of my natiue Countrey, but ſurprized with a deepe melancholy, I entred into a ſerious conſideration of what I had too raſhly ſpoken:I called my meditatiõs to a ſtrict accompt, to examine what motiue ſhould make me run ſo far beyond my intended purpoſe, to meet the Ambition of my Countrey or mine owne affection The remembrance of ſome grieuances, ſeconded by mine inbred Nature, neuer taught to fawne on miſpriſion,began to checke my officious pen,as guilty of too much weakneſſe or adulation: when ſuddainly as in a viſion there appeared vnto me my Mother *Oxford* vſher'd in by *Iſis* & all his *Muſes*, who with a diſcontented countenance and harſh language, ſeemed to chide me in this manner:

Fond Sonne, who taught thy vndeſerued praiſe,
To crown thy country with theſe thankleſſe Baies?
What oweſt thou vnto that barren Earth
But harſh reproach, ſad cares, and hapleſſe Birth?
What Legacie bequeath'd that ſoile to thee,
But fruitleſſe Hopes, and helpleſſe Pouerty?
What thou haſt ſpoken of thy Weſterne ſtronds,
Will ſooner plough vp mine, then cure thy wounds.
Had thy neglected Muſe without a Name,
Spent halfe this induſtry to ſpinne my fame;
Iſis had graced thee with Muſes more
Then euer tript on thy *Deuonian* ſhore.
Which of theſe Worthies whom thou crown'ſt with praiſe
Will ere thy wants relieue, or Fortunes raiſe?
All the proud wooers of the Siſters Nine,
Like Pilgrims come to worſhip at my ſhrine:
And vaunteſt thou on *Deuons* part their Names
Who owe to me their worth, to her their ſhames?
The prime and choice of all thy glorious flowres
Cropt from my gardens and admired Bowres,
Ought to returne the tribute of their praiſe
Vnto my golden tongue and learned Layes:
Nor had thy Weſterne Confines euer found
A Muſe to ſing of thy *Deuonian* ground,
Had not I touched her ambitious tongue
Firſt taught to chaunt amongſt my learned throng.
How oft haſt thou drawne out thy precious time
To tutour in my armes their youthly prime,
Who like reſpectleſſe and vntutour'd ſwaines,
With loſſe and obloquie reward thy paines?
Such are thy Darlings whom thou mak'ſt to ride
In a triumphant carre by Honours ſide:
As if proud *Honour* which can Kings command,
As a poore ſeruant waited on thy hand.
Thus thou vnwiſe giu'ſt immortality
To thoſe, whoſe baſe reproches follow thee.
Had thine Ambition waited on my ſprings,

The breath of Princes, and the pow'r of Kings
Had ſeconded thy Hopes, which now accuſe
To my diſgrace and griefe thy hapleſſe Muſe.
Thy wants inforce thee ſtill with me to ſtay,
When each *Pedant* or makes or findes his way.
To play and ſtake it at that lawleſſe Game,
Selling my Honours for to buy their ſhame:
Vnhappy purchaſe ow'd to Charity,
Bought by conniuence, ſold to Periury;
By griping Brokers, ſince the fatall time
That faire *Aſtræa* left thy thankeleſſe Clime.
Thus thy admired *Deuons* charity
Sets ſtrangers in her lappe aud ſhuts out Thee.
Haſt thou been honour'd by my ſacred Breath,
'Mongſt rude *Arcadians* thus to beg a Death?
What greater glory can thy aſhes haue,
Then in my flowry groues to dig thy graue?
Although the leaſt among my learned ſonnes,
Thy fortunes told thee that I lou'd thee once,
And ſo doe ſtill: although my hapleſſe Baies
Taught thy deſpaire to ſpinne out careleſſe dayes,
And to compoſe thy diſcontented Head
To ſlumber ſoftly on the Muſes Bed.
Be rul'd by me my poore, yet loued Son, (done:
Truſt not their ſmiles whoſe wrongs haue thee vn-
Thy faire Hopes grounded on thy place of birth,
Will fly in *Atomes* or conſume in Earth;
Before within that Hemiſpheare of thine,
Thy *Deuons Sunne* on thee ſhall euer ſhine.
Then truſt vnto my bounty, turne thy ſight
From thy darke Confines to my golden light.
All thy endowments owed to my wombe,
Returne them back, and there erect thy tombe.
If no *Mecenas* crowne thee with his Rayes,
Teach thy content to ſleepe out quiet dayes.
Let Contemplation with tranſpiercing eyes,
Mount thee a pitch beyond the ſtarry ſkyes.

And there preſent thee that eternall *glaſſe*,
Wherein the greatneſſe of this wondrous maſſe,
Shrinkes to an *Atome*; where my *Aſtrolabe*
Shall ſhew thee ſtarres beyond thy painted Globe:
Where thou aloft as from a mountaine ſteepe,
Shalt ſee the greateſt men like Antes to creepe:
Thy dayes ſhall miniſter thee choiceſt Theames,
Which night ſhall render in delicious dreames;
And thy ſeuere Philoſophy the whiles,
In amourous kinde ſhall courte thee with her ſmiles.
Or if thy nature with conſtraint, deſcends
Below her owne delight, to practick endes;
Riſe with my morning *Phœbus*, ſlight the *Weſt*,
Till furrowed Age inuite thee to reſt.
And then perchance, thy Earth which ſeldome gaue,
Thee Aire to breath, will lend thy Corps a graue.
Soone the laſt trumpet will be heard to ſound,
And of thy load Eaſe the *Deuonian* ground.
Meane time if any gentle ſwaine come by,
To view the marble where thy aſhes ly,
He may vpon that ſtone in fewer yeeres,
Engraue an *Epitaph* with fretting teares,
Then make mens frozen hearts with all his cries
Drink in a drop from his diſtilling eyes:
Yet will I promiſe thy neglected bones
A firmer monument then ſpeachles ſtones,
And when I pine with age, and wits with ruſt,
Seraphick Angells ſhall dreſerue thy duſt,
And all good men acknowledge ſhall with me
Thou lou'ſt thy Countrey, when ſhe hateth thee.

This ſtrange reproofe of an indulgent mother, I could not entertaine without paſſion: In ſo much as without feare or wit, I aduentured in this ſort, to anſwer her, in her owne language.

Ad Matrem Academiam.

Vnkindeſt *mother*, haue my former yeeres
So much deſeru'd thy hate, or theſe my teares?

Thus to diuorce me from my place of birth,
To be a ſtranger to my natiue Earth?
Wilt thou expoſe him on thy common ſtage,
To ſtriue and ſtruggle in an Iron age;
Whoſe low ambition neuer learn'd of thee
The curious Artes of thriuing policy?
Thy golden tongue from which my yonger dayes
Suckt the ſweet muſick of thy learned layes,
Was better taught thy office then my fate,
To make me thine, yet moſt vnfortunate.
Why was I foſtred in thy learned ſchooles,
To ſtudy with for the reward of fooles:
That while I ſate to heare the Muſes ſing,
The *Winter* ſuddenly ore-took my *Spring*:
Haue I ſo played the truant with my howres,
Or with baſe riot ſtained thy ſacred Bowres,
Or as a Viper did I euer ſtriue,
To gnaw a paſſage through thy wombe to thriue:
To pluck me thus from *Deuons* breſt, to try
What thou canſt doe when as thy dugges are dry?
When my ſhort thread of life is almoſt ſpunne,
Thou biddſt me riſe vp with thy morning Sun;
And like a *Heliotrope* adore the *Eaſt*,
When my care-haſtened Age arriues at *Weſt*.
Could I encounter (as I once did hope,)
The God of *learning* in the *Horoſcope*,
My *Phœbus* would auſpicious lookes incline,
On my hard fate, and diſcontents to ſhine:
Now lodged in a luckles *houſe*, reiects
My former ſuites, and frownes with ſad *aſpects*.
Had I been borne when that eternall hand
Wrapt the infant world in her firſt ſwadling band,
Before *Philoſophy* was taught the way,
To rock the cradle in which Nature lay,
My *Learning* had been *Husbandry*: My *Birth*
Had ow'd no toll but to the virgine *Earth*:
Nor had I courted for theſe thirty yeeres,

Thy ſeuen proud minions with officious teares:
To liue had been my induſtry: no tongue
Had taxt thy *honours*, guilty of my *wrong*.
Had I been *ſhepheard* on our *Weſterne* plaines,
I might haue ſung amongſt thoſe happy ſwaines;
Some ſhepheardeſſe hearing my melody,
Might haue been charmed kind as charity,
And taught me thoſe ſad minutes to repriue,
Which I haue loſt in ſtudying how to thriue.
Had I aduẽtur'd on the briniſh fome,
And ſworne my ſelfe a ſtranger to my home
Till time the *Harueſt* reapt my *youth* did owe,
And *Ages* winter had ſpent all her ſnow
Vpon my haires; what worſer could I haue,
Then looſe thy frownes to find a wiſhed graue?
The *Scythian* hewne from *Caucaſus* would aske
Before my ſlaughter, why a needles taske
Of *Trauaile* I ſhould vndertake, to ſee
Their Countreyes bounds and my ſad miſery?
But hearing my harſh bondage vnder *thee*,
Would thine vnkindneſſe hate and pitty *me*.
To ſee thy Child far ſeuer'd from thy wombe
The *Canniball* would make himſelfe my tombe;
And till his *owne* were ſpent preſerue *my* duſt,
In his deere vrne which thou haſt ſleightly loſt.
Canſt thou neglected ſee his *Age* to freeze,
Whoſe *youth* thou dandl'ſt on indulgent knees?
The fowle aſperſions on my *Deuon* throwne,
Thou mightſt in right acknowledge for thine owne.
Only this difference: to men wanting worth
They *ſell* preferments, and thou *ſends* them forth.
Canſt thou be brib'd to honour with a kiſſe
Thy guilded folly which deſerues the hiſſe?
If thy foc'd wants and flattery conſpire,
To ſell thy *Scarlet* to a worthles Squire,
Or grace with *miniuere* ſome *proſelite*
Who nere knew artes, or reade the *Stagirite*;

Yet ſhould thy hand be frugall to preſerue
That ſtock for want of which thy ſonnes may ſtarue.
Haue I ſeru'd out three *prentiſhips*, yet find
Thy trade inferiour to the humbleſt mind?
And that outſtript by vnthrifts, which were ſent
Free with indentures ere their yeeres were ſpent?
Then ceaſe yee ſiſters of the *Theſpian* ſprings,
Thalia burne thy books and breake thy ſtrings,
And mother make thy ſelfe a *ſecond* Tombe
For all thy offſpring, and ſo ſhut thy wombe.
Accuſe not my iuſt anger, but the *cauſe*
Nature may vrge, but fury ſcornes her lawes.
I fawn'd too long on Iuſtice: Sith that failes,
Storme *Indignation* and blow vp my ſailes;
Ingenious choller arm'd with Scorpions ſtings
Which whipp'ſt on Peſants, and commandeſt Kings,
And giu'ſt each milky ſoule a penne to write
Though all the world turned a *paraſite*;
Temper my braines, thy bitterneſſe infuſe,
Deſcend and dictate to my angry Muſe.
O pardon mother ſomething checkes my ſpleene,
And from thy face takes off my angry teene:
Reuolted *Nature* by the ſame degrees
Goes and returnes; begges pardon on her knees:
Thou art a *mirrour* by reflexion taught
To faigne defects, yet guilty art of naught.
Thy *ſtewards* which by thy indulgence thriue
Were they as iuſt, as thou art free to giue,
We all might ſhare a portion of that ſtore,
Which now thy *ſonnes* deſerue, thy *ſlaues* deuoure.
Thy *will* is ſeldome meaſur'd by the *Law*,
But *power*, whoſe greatneſſe thy Edicts can awe,
Slights thy decrees: O would Imperiall *Ioue*
But once deſcend from his high Court aboue,
To ſee thy innocent and maiden hands,
By thine owne ſeruants baſely ſhut in bands:
Theſe *Caterpillars* by his three-forkt Rayes,

Would ſoone be ſcorch'd from off thy ſacred *Bayes*;
And thou reſtor'd vnto that priſtine-hue,
Which ancient times admir'd ours neuer knew.

All this time as in a fit of phrenſy I haue ſpoken, I ſcarce know what my ſelfe: I feare mee too much, to, or of, my *Countrey* and *Vniuerſity*, and too little for the preſent purpoſe. Now as one ſuddainly awaked out of ſleep, no otherwiſe then in a dreame I remember the *occaſion*: We haue all a *ſemel Inſaniuimus*, and as a learned man of this Vniuerſity ſeemes to maintaine, no man hath euer had the happineſſe to be exempted from this imputation: And therefore I hope my Reader will pardon mee this once, if in ſuch a generall concourſe and conſpiracy of mad men, I ſometimes ſhew my ſelfe mad for company.

3 Windy *Regions produce men of wild and inſtable diſpoſitions; but* quiet *regions more conſtant and curteous.*

The cauſe of this diſparity is apparant; becauſe a quiet mind, and apt for contemplation, cannot bee in ſuch a man, as is perpetually toſſed to and fro. For no man can well contemplate, except hee haue his mind purged and free from motion of the body; and it is noted by *Phyſiognomers* that *wiſer* men are *ſlower* in the motion of their body and mind, whereas *mad* and *franticke* men are alwaies buſied in body and mind. Hence a reaſon may be giuen why *Mariners* and *ſeamen* being continually toſſed with the wind, are obſerued to be more *barbarous*, *inhumane*, and *inconſtant*. Another reaſon of this inconſtancie and change, may bee drawne from the change of the *Aire*, cauſed by diuerſity of winds; For wind being an exhalation affecting the aire and deriued from the Earth, mnſt needs be diuerſe in regard of the diuerſe regions, from whence it bloweth. what cauſe ſoeuer be imagined, it is moſt certaine that people in windy regions haue been more warlike, though perhaps leſſe humane: As in *Thracia*, *France*, *Circaſſia*, *Lybia*, *Portugall*, *Perſia*, *Noruegia*, and *Polonia*: But in places in the ſame tract where the wind hath a leſſe domination we ſhall find them more tractable, but leſſe valiant, as *Aſyria*, *Aſia minor*, *Italy* for the moſt part, and *Egypt*. In like manner the people of *Gallia Narbonenſis*, *Aquitany*, and *Prouence* in *France*, are obſerued to bee the moſt *warlike*, although ſituate in a more Southerne tract: Being daily infeſted, partly by the *Vulturnus*, partly by the *Corus*, which in theſe parts hath great power.

4 *Sea-borderers are generally more witty and adorned with more knowledge, then Inlanders, though ſubiect to greater vices.*

That *Artes*, *Ciuility*, and many *inuentions* are owed to the *ſea*, as the mother of encreaſe, ſeemes a matter out of queſtion: For ſith all nations haue not found out all *arts* and *inuentions* it muſt follow neceſſarily, that they haue been propagated by *traffick*, and commerce with forraine nations: Whence it comes to paſſe many times that *Sea-borderers* by conference with *out-landiſh* people, haue gotten that knowledge and experience of things, for which others haue with great coſt and danger aduentured on long and tedious trauailes: Which I take to bee the reaſon why *Themiſtocles* would haue a Citie depending on the ſea, and not as *Cælius Rhodoginus* imagines, that hee might transferre the power from the *Nobility*, to the *Ship-maſters*. Thus we find *ſciences* and *learning* to haue been deriued from the *Chaldeans* to the *Egyptians*, from the *Egyptians* to the *Phænicians*, from them to the *Grecians* and *Romans*: And in our dayes euery man can ſpeake how much the induſtrie of the *Venetians*, *Spaniards*, *Hollanders*, *Engliſh*, and *Portugalls* haue effected in both *Indies*, in trafficking with them, deriuing together with their merchandize, much of their owne *knowledge* and *religion*. But as the *Ilanders* and *ſea-bordering* people haue excelled the *Inland* nations in *skill* and *knowledge*, ſo alſo in *vices*: Which ſtands with reaſon, whether we aſcribe it to their naturall *wit* or condition of life, or *education*. For the greateſt wits are commonly matched with the greateſt vices, as depending on ſuch a temper of the braine whoſe ſmalleſt change may beget madneſſe: according to that prouerbe, *Nullum magnum ingenium ſine mixtura inſaniæ.* Alſo Artes and Sciences turned to the worſt vſe, become more dangerous, then naked *ſimplicity*; for there is nothing to be feared more then *armed furie.* This might bee the cauſe why *Plato* in his booke *de Republica* warnes men to auoid the Sea, as the mother of wickedneſſe. Which is ſeconded by *Strabo*, who deriues the of-ſpring of *Robbery, pillage,* and *murther*, from the *Sea:* By which argument, the old *Athenians* were induced to draw the Inhabitants as much as they could from *Sea-trafficke* to *husbandry* and tillage of the Earth: Whence came at firſt (as ſome imagine) that fable of *Neptune* ſtriuing with *Minerua* for victory, againſt whom ſhe preuailed, by ſhewing the iudges a *mandrakes* apple as an eſpeciall rarity of the land.

CHAP. XVI.

Of the diſpoſitions of Inhabitants according to their Originall and Education.

1 IN the third place there may be a diuerſity of Inhabitants in diſpoſition, either in reſpect of their *Offſpring*, or their *Education.* In the former we are to conſider the diſpoſitions of nations ſo farre forth, as it depends from their firſt *ſtocke* and *originall.*

By the firſt ſtocke and originall of nations, wee vnderſtand not here either the firſt offſpring from the loynes of *Adam*, or the ſecond from *Noah*; becauſe theſe two are common to all nations of the world, and therefore cannot vary the ſeuerall diſpoſitions of people: But the more *mediate* or ſpeciall ſtocke whence they ſprang, which is found to haue no ſmall power in the nature and temper of poſterity. In this of-ſpring two things are chiefely remarkeable; firſt, how people ſuffer an alteration in reſpect of their ſeuerall *Tranſplantations*: Secondly, in the *mixture* of colonies, both which we will ſhew in theſe Theoremes.

1 *Colonies tranſplanted from one region into another, far remote, retaine a long time their firſt diſpoſition, though by little and litle they decline and ſuffer alteration.*

All *mutation* requires a certaine diſtance of time: Sith no motion according to *Ariſtotle* is in an inſtant, neither is it a ſmall time can alter the naturall *complexion* of men: For as much as the children for the moſt part deriue their nature from their parents, and euery mans conſtitution is commonly radically grounded, and not eaſily ſubiect to externall change: Thus we ſee the Children of *Blackmores* being tranſplanted into *Europe* for diuerſe deſcents to continue *black*: Yet ſo as they by little and little declining from their former hue, will in time become *white*; as the reſt of the *European* Inhabitants: For otherwiſe it muſt needs follow, that *Scythia* ſhould at this day breed many *Blackmores*, and *Ethiopia* many *white*; becauſe no queſtion can bee made, but that all nations almoſt of the world ſince the beginning haue ſuffered *mixture*. Wee reade that the *Gothes*, being a warlike people of the *North*, long after their firſt inuaſion of *Spaine*, *France*, *Italy*, and other Territories of *Europe*, retained their owne *diſpoſition* and *nature*, altogether diſagreeing with the nations, amongſt whom they liued: gouerning (as is the manner of *Northerne* Potentates) rather by *Strength* then *Policy*, better able to *winne* then *eſtabliſh* an Empire. But in proceſſe of time it came to paſſe, that putting off their harſh temper they grew into one nation with the natiue Inhabitants, as in *France* and *Italy*, or at leaſt as in *Spaine*, eſtabliſhing a gouernment of their owne, by little and little declined from their rudeneſſe to ciuility, turning their armes to *Arts*, their ſtrength to *ſtratagemmes*, hauing of late yeeres by witty pollicy eſtabliſhed a greater empire, then euer their Anceſtours could atcheiue by multitudes of men, and ſtrength of armes. And it is worth obſeruation, that as theſe haue ſuffered a change of *Lawes*, *cuſtomes*, *gouernment*, which they owe more to the nature of the *Climate* then to *Education*; ſo in their very language. For the language of the *Gothes* heretofore, differed little from the language of the ancient *Germans*, which (as moſt *Northerne* languages) was very rough, conſiſting of many hard and harſh aſpirations, with vnpleaſant colliſion of many *conſonants* together: But at this day is changed into a very elegant tongue pleaſant to the eare, conſiſting of many *vowels* and the ſofteſt aſpirations. Finally ſuch haue beene the alterations of this people, that being heretofore farre *North* aud *branded* with all the markes of *Northerne rudeneſſe*, they are now eſteemed in the Catalogue of *Southerne Inhabitants*: Not in regard, as much of *place*, as *nature*. The like may wee obſerue of the *Turkes* and *Tartars*, who ſpreading their empire from the *North* towards the *South*, a long time retained their rude barbarous *nature*, which they haue not at this day altogether caſt off; yet ſo much hath time and place gained vpon their temper, that they are much mollified and farre more tractable to *humanity*, addicting themſelues euery day more and more to the ſtudy of *artes* and *ciuility*: in ſo much that (as one obſerues) had they not preſerued their ſtrict *diſcipline* in training vp their youth to *armes*, they had long ſince loſt much of their large empire, and haue yeelded to the *Polonian* and *Muſcouite*. This change may we find not onely in *mankinde*, but alſo in *beaſts* and *plants*, which being tranſported into other regions, though a long time retaining their natiue perfection, will notwithſtanding in time by little and little degenerate: As I haue heard by relation of ſome of our *Virginian* colony in *America*: who finde a great alteration in our Corne and Cattle, tranſlated thither. This might alſo bee obſerued in the

Danes, *Saxons*, and *Angles*, comming into *Britanny*, who partly by the *Climate*, partly by *mixture* with them, by little and little depoſed their diſpoſition, and became more *ciuill*. The like may be ſpoken of the *Saxon*-colonies ſent by *Charles* the great into *Belgia*, who ſince that time becomming more *ciuill* haue proued leſſe warlike, looſing as much by the one, as they obtained by the other. This point I will no further proſecute, becauſe I hold it ſufficiently demonſtrated out of that I haue ſpoken of the variety of naturall diſpoſitions according to the heauenly *ſituation*, and the *ſoile*. For ſith all nations came at firſt from one *originall*, we muſt needs aſcribe this mutation to the places which they inhabite.

2 *The* mixture *of* Colonies *begets in the ſame nation a greater diſparity and variety of the Inhabitants amongſt themſelues*

This propoſition is by naturall conſequence deduced from the former: Becauſe all *Colonies* tranſplanted retaining ſome-what of their former nature, the *Mixture* muſt produce *variety*. Firſt, becauſe the *number* of people of any region by this is ſuppoſed to conſiſt of more kindes of diſpoſitions: Secondly, becauſe the promiſcuous *mixture* of theſe kindes being vnequally tempered, muſt according to their ſeuerall combinations produce people, as vnlike one to the other, as to the former. Hence a reaſon may bee giuen, why the Inhabitants of the *extreame* regions, either *North* or *South* are found to bee amongſt themſelues as well in *temper*, as in externall *face* and habite more like one to the other: whereas the *middle* partake of more variety. For the *Cimbrians*, *Danes*, and other *Scythians*, are for the moſt part of a *whitiſh* hue; with flaxen, and yellow *haire*; on the other ſide the *Ethiopians* for the moſt part are *blacke-haired* and *curled*. The *French*, *Germans*, and the *Engliſh*, admit of all variety, hauing ſome *white-haired*, ſome *black*, ſome *yellow*, ſome *tawny*, ſome *ſmooth* and ſome *curled-pates*. This diuerſity the *Stoicks* would aſcribe to the *phantaſie*, or image conceiued in the minds of men. Whence they would giue a cauſe, why beaſts commonly bring forth yong, more like one the other then men; becauſe (ſay they) wanting a *reaſonable* ſoule they are not ſtirred vp as men with ſundry cogitations, but onely with ſenſe. So the *Scithian* and *Northerne* man being by nature more *ſimple*, and affecting thoſe pleaſures which are agreeable to nature, and leſſe diſtracted by variety of thoughts, is found to beget children more like their parents then thoſe of the *middle climate*. This cauſe wee ſhould admit probable enough, but for a reaſon vrged by *Bodin* and others, that in *Æthiopia*, where the people of all other is more *Acute*, and more *violent* in luſt, they are moſt like one to the other. For euen all are found to be *ſmall* of ſtature, *curle-pated*, *black-ſkinned*, *flat-noſed*, *ſmooth-ſkinned*, *great-lip't*, *white-toothed*, *black-eyed*: Wherefore this infinite diuerſity in the middle region, we cannot well aſcribe to any other reaſon, then the manifold *intermixtion* and *combination* of both the *extreames*. Whence it comes to paſſe, that by how much more we wander from the *middle region*, ſo much the more ſhall wee finde the people amongſt themſelues: In ſo much as *Tacitus* ſpake of the *Germans*, that amongſt themſelues they were very like in reſpect of other nations. This mixture in the *middle region* out of the *extreames*, may eaſily be ſhewed out of diuerſe *Colonies*, which from the *extreames*, haue beene tranſlated into the *middle region*, as the better place of habitation. For hither came the great and extraordinary armies of the *Scythians*, *Gothes*, *Turkes* and *Tartars*; None beſides the *Vandalls* paſſed into *Africke*, from whence they were in ſhort time expulſed. The *Arabians* and *Punicæans* called by the ancient *Saracens*, leading their Colonies into *Europe* and *Aſia*, ſetled themſelues in the *middle* region; None came into *Scythia*: for when they had inuaded *Spaine*, *Italy* and *France*, they were in *France* altogether broken, and cut off: After which, *Spaine* and *Italy* found a meanes to free themſelues from their bondage. Likewiſe the Colonyes of the *Celtes* and *Romans*, endeauoured alwaies to ſettle themſelues in the *middle Regions*, and neuer ventured as farre as *Scythia* Northward, or Southward as farre as *Æthiopia*: Whence the *middle* charged with intermixture of both *extreames* begat a great diuerſity. For we find by experience, that out of the mixture of diuerſe *kinds*, diuerſe *Formes* and *Natures* are ingendred : As of the *Mule, Leopard, Crocuta, Lyciſca*, and *Camelopardus*; which being *mixt* Creatures are vnlike their Sires : So may we iudge of the various mixture of diuerſe kinds of men. A *Maſtiffe* or *Lyciſca*, little differs from a *Wolfe*, becauſe he was conceiued of a *Wolfe* and a *Dogge*; So that a *Wolfe* is (as *Varro* noteth) nothing elſe then a *wilde Dogge*. But on the other ſide, a *Mule* from an *Aſſe* and a *Horſe*, As a *Camelopardus* from a *Panthor* and a *Camell*, differ very much; ſo that if people very neere in *Nature* be linckt together, they produce an of-ſpring very like themſelues: But if two very vnlike in nature, as an *Ethiopian* and a *Scythian* ſhould match together, they muſt needs bring forth a birth very vnlike to themſelues: like a *Perſonated man* brought vpon the ſtage by *Ptolomæus Philedephus*, who (as *Athenæus* writes) was of two colours, on one ſide *white*, on the other *blacke*.

2 The ſecond point whereby the diſpoſition of people is varied, is *Education*. Education is the exerciſe of many people in religions, or morall diſcipline.

Amongſt all externall cauſes of the change of diſpoſitions, there is none greater then *Education*. For as a good nature is oftentimes corrupted with euill conuerſation, ſo an ill diſpoſition with good inſtitution hath in ſome ſort been corrected. The chiefe obiects of diſcipline are *Religion* and *Morality*: Whereof we giue the chiefeſt prerogatiue to *Religion*, as that which more immediatly bindeth the *conſciences* of men, euen againſt nature. In the ſecond place *Ciuility*; whoſe end is worldly happineſſe. How far each of theſe preuaile, ſhall bee ſhewed in theſe Theoremes.

1 Education *hath great force in the alteration of naturall diſpoſitions : yet ſo as by accident*

remitted, they ſoone returne to their former temper.

The force of *inſtitution* hath been ſo great, that by ſome it hath been thought to equall, if not ſurmount *Nature*; whence they haue tearmed it a *ſecond nature*: For as wee ſee all ſortes of *Plantes* and *Hearbs* by good husbandry, to grow better, but left to themſelues to grow wilde and barren; So ſhall wee find it, if not much more, in *mankind*; which though neuer ſo *Sauage* and *Barbarous*, haue by diſcipline been corrected and reformed, and though neuer ſo *Polite* and ciuill neglecting diſcipline, haue degenerated, and growne barbarous. For if the externall lineaments of the *body* may bee by art (as it were) wrought into another mould, much more may wee aſcribe this to the habits and operations of the *mind*, being of a more agill nature, and apter to receiue impreſſion. The ancients amongſt the *French* (as *Bodin* teſtifies) deemed a long viſage the moſt handſome: Whence the Midwiues endeuoured to frame moſt faces to this faſhion, as may bee ſeene in moſt ancient ſtatues and images. In *India* (as wee alſo reade) a *great noſe* and a *broad face* was moſt admitted: which cauſed their Midwiues to effect it as neere as they could in their tender infants. In like manner it hath been the endeauour and ambition of moſt teachers, and informers of youth, to frame the *wits* of their nouices to ſuch diſciplines and perfections, as in the ſame country found moſt honor & beſt acceptance. Hence it came to paſſe that *cuſtome* preuailing beyond *nature*, many nations ſituate in a ruder climate, wanting that benefit of the *Heauens* which others plentifully *inioye*, haue ſurpaſſed them in *Artes*, *Sciences*, and many other *Endowments* of the minde. In ſo triuiall a matter wee will not roue farre for example. It is recorded by the ancients as well of the *Germans*, as of our *owne* nation, that they liued almoſt in the condition of *wilde beaſts* in Woods and Deſarts, feeding like ſwine on *hearbs* and *rootes*, without law or *diſcipline*: In ſo much as their *Bardes* or learned men (as they deemed them) wanting the vſe of *letters*, challenged their chiefeſt perfection in the compoſure of certaine *rimes* of triuiall ſubiects to pleaſe the people. Their *houſes* were caues, their *pallaces brackes and thickets*, their *tables rockes* (as one ſaith of them) *Antra lares, dumeta thoros, cænacula rupes,* They were (as *Iuſtine* ſpeakes of the infancy of the world) rather carefull to keepe their owne, then ambitious to conquer others; and more ſtudious to preſerue life then ſeeke honour. Their onely law was nature, or ſome few cuſtomes preſerued by tradition, not writing: Little differing from the preſent *Americans*, not yet reduced to ciuility. But *time* and *diſcipline* preuailing againſt *barbariſme*, they are (God be praiſed) reduced to ſuch a height of ciuility, that they may (as it were) reade other mens wantes in their owne perfections, and meaſure other mens loſſe by their owne gaines. Inſomuch as they ſeeme to haue robbed the *Aſiaticks* of *humanitie*, the *Romans* of *militarie Diſcipline*, the *Hebrewes* of *Religion*, the *Grecians* of *Philoſophie*, the *Ægiptians* of *Geometry*, the *Phœnicians* of *Arithmetick*, the *Chaldæans* of *Aſtrologie*, and almoſt all the world of curious *Workmanſhip*. This their excellency hath bin ſo fortunate, as to ſet them in the enuy of other nations, who notwithſtanding haue beene faine to borrow of their ſtore. The *Italians* are cenſured by *Machiauell* the *Florentine* for ſending for *Germans* to meaſure their land, chalenging to themſelues the prerogatiue of *wit*, aboue other nations. Likewiſe *Pope Leo* diſpatched his Embaſſador into *Germany* for *Mathematicians*, to rectifie the *calender*, as ſometimes *Cæſar* into *Ægipt*. This force of diſcipline how great ſoeuer being for a time neglected, *nature* is notwithſtanding found to returne to her owne corruption. A prime example of it we haue in the *Romans* and *Italians*, heeretofore for *Artes* and *Military* diſcipline carrying away the palme from the whole world: But now degenerated ſo much, as it may ſeeme the image of *baſeneſſe*; ſubmitting their neckes to the pride of an inſulting *Prelate*, farre more abiect then the loſſe of their *libertie* vnder *Cæſar*, or the *Gothiſh* vſurpation of *Alaricus*. The like effect of this neglect of diſcipline may we find in the *Hebrewes*, *Chaldæans*, *Phænicians*, *Ægiptians*, *Græcians*, and *Indians*, who were ſometimes admired for *learning* and *Eloquence*, and ſet in the higheſt top of perfection. Wherefore *Ariſtotle* had good reaſon in his firſt booke *de Cœlo* to affirme, that *Artes* and *Sciences* with all nations had beene ſubiect to *ebbes* and *flowes*, ſometimes *flouriſhing* in great perfection, and ſometimes *languiſhing* and contemned. And to this and no other cauſe; can we aſcribe the preſent *Ignorance* and *Barbariſme* of the *Americans*: Their deſcent being from *Noah* and his poſterity, they could not at firſt but haue ſome forme of *diſcipline*, which afterwards being by long proceſſe of time or incertainty of *tradition* neglected and obliterated, they fell backe into ſuch wayes as their owne depraued nature dictated or the diuell malitiouſly ſuggeſted.

2 *By* Diſcipline *nations become more* wiſe *and* politicke *in the preſeruations of ſtates, yet leſſe* ſtout *and couragious.*

As *Diſcipline* hath been the chiefe cauſe of the eſtabliſhment of all ſtates; ſo hath it on the other ſide been occaſion to *ſoften* and weaken the courage of many nations: For it hath beene many times ſeene, that ſuch people who haue beene commended for *wit*, haue yeelded to ſuch who are of a ruder diſpoſition: as at this day the *Greeks* and *Macedons* to the *Turkes*, the ancient *Gaules* to the *French*, the *Egyptians* to the *Perſians*, the *Chaldeans* to the *Saracens*. Hence ſome giue a reaſon why the *French* did inuade and runne ouer *Italy* without controle vnder *Charles* the 5; becauſe the *Italian* Princes at that time were giuen to *ſtudy* and *learning*; and it is obſerued that the ancient *courage* of the *Turke* is much abated, ſince the time that they grew more ciuill and more ſtrictly imbraced diſcipline. And this ſome thinke to haue giuen occaſion to *Alexander* the great, to conquer the *Perſian Monarchie*, the *Perſians* hauing beene before reduced to ciuility, and loſt their hardneſſe. And we daily ſee by experience, that no men are more deſperate and aduenturous, then thoſe which are *rude* and *barbarous*, wanting all good *manners* and *education*. None more *fearefull* and many times more *cowardlike* then ſuch as are moſt *wiſe* and *politick*: an example of the former we haue in *Aiax*, of the other in *Vliſſes*, wherevpon the wiſeſt *leaders* and commanders haue not been eſteemed the moſt valiant. A certaine Engliſh gentleman writing military obſeruations affirmes the *French nobility* to bee more valorous and coragious then the *Engliſh*: Becauſe of the looſeneſſe of their *diſcipline* and the *ſtrictneſſe* of ours. But I will neither grant him the one or the other, neither can I auerre their *courage* to be greater, or our *diſcipline* ſtricter. If their valour bee more, it muſt needs follow their *wit* is leſſe out of this ground. But howſoeuer it be, I am ſure that *Cæſar* and *Tacitus* giue the cauſe of the great ſtature and courage of the *Germans* to be their *looſeneſſe* and *liberty*, which howbeit it bee not the ſole cauſe, it muſt needs bee a great helpe. For wee plainely finde by experience that thoſe countries which be moſt *mountanous* where is leſſe diſcipline, are found to produce men for the moſt part, moſt *warlicke*: Such as the *Suitzers in Germany* and *Biſcaynes* and *Arragonians* in *Spaine*. Whence (as ſome obſerue) ſuch countries as are partly *Mountanous*, partly *plaine* are ſeldome at quiet, the one part willingly ſubmitting themſelues to gouernment, the other affecting warre and rebellion. Which hath been the cauſe of the troubles of *Naples*, and in *England* before *Henry the eight's time* betwixt the *Welſh* and *Engliſh*. Why diſcipline ſhould in this ſort mollifie and weaken the courage of men, many cauſes may bee giuen. The firſt and greateſt is *Religion*, then the which, there is no greater curbe to the courage: not meerely of it ſelfe, but by accident; Becauſe *Death* being the greateſt hazard of a *ſouldier*, religion giues a more euident *apprehenſion* and *ſenſe* of the *immortality* of the ſoule of man, and ſets before the eye of his vnderſtanding, as it were the images of *Hell-paines* and *Cæleſtiall ioyes*, weighing in an æquall ſcale the danger of the one, and the loſſe of the other. Whereas ignorant people wanting all ſenſe of *religion* lightly eſteeme of either, holding a temporall death the greateſt danger. Whence grew the vſuall Prouerbe amongſt profane Ruffians; that *conſcience makes cowards*. But this (as I ſaid) is meerely accidentall : For as much as nothing ſpurres on a true reſolution more then a *good conſcience*, and a true touch of religion: witneſſe the holy *Martyrs* of the *Church* of all ages, whoſe valour and conſtancy hath outgone all heathen preſidents. But becauſe ſouldiers for the moſt part, being a moſt diſſolute kinde of people, hauing either a *falſe religion* which can ſuggeſt no ſetled reſolution, or an ill conſcience grounded vpon no aſſurance, *Religion* muſt needs beget in them a more fearefull diſpoſition. Another cauſe may bee the ſeuerity of diſcipline, which eſpecially in the training vp of youth, is mixed with a kind of ſlauery: without which our yonger yeers are very vntractable to taſt the bitter roots of *knowledge*. This *feare* (as it were) ſtamped in our affections cannot but leaue behind it a continuall impreſſion, which cannot ſuddainly bee razed out. Such as we find in vs of our *maſters* and *teachers*, whoſe *friendſhip* we rather imbrace, then *familiarity*. A third reaſon, why diſcipline would weaken and mollifie a Nation, may be the delight which men reape in *Contemplatiue* ſtudies, and *morall* or *politicke* duties, whence followes a neglect of the other. For people of *knowledge* muſt needs finde a greater felicity in giftes of the minde, which is vſually ſeconded with a contempt of externall and military affaires. The laſt cauſe may bee the want of vſe and practiſe of military affaires in moſt common-wealths; for many ſtates well eſtabliſhed continue a long time without warres, neither moleſting their neighbours, nor diſſenting amongſt themſelues; except very ſeldome, and that by a ſmall army, without troubling the whole ſtate: whence the generall practiſe being leſſe knowne, becomes more fearefull. Notwithſtanding, all this it were brutiſh to imagine *diſcipline* any way *vnneceſſary* or *hurtfull*, either to a *Captaine* or *Stateſman*. For as much as it more ſtrengthens the *wit* then abates the courage of a nation. Neither is it properly ſaid to breake and weaken, but rather to temper and regulate our ſpirits. For it is not *valour*, but rather *raſhneſſe* or *fierceneſſe*, which is not managed with *policy* and diſcretion. And although it hath ſometimes beene attended with notable exploites, as that of *Alexander*

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the *great*, of the *Gothes*, the *ancient Gaules* and many other. Yet ſhall we obſerue ſuch conqueſts, to bee of ſmall continuance: For what they atcheiued by *ſtrength*, they loſt for want of *policy*. So that it is well ſaid by one: that *moderation* is the mother of *continuance*, to *States* and *Kingdomes*. Thus haue we run ouer (by Gods aſſiſtance) the chiefe *cauſes* of diuerſity of *diſpoſitions* of Nations: Wherein if any man will informe himſelfe (as hee ſhould) hee muſt compare one circumſtance with another, and make his iudgement not from a *man* but a nation; and not cenſure any Nation out of *one* obſeruation: For *practiſe* in *Art* cannot alwayes come home to *ſpeculation*. So *experience* in this kinde will oftentimes croſſe the moſt generall *rules* wee can imagine. Tis enough to iudge as wee finde, and walke where the way is open; If any man will deſire more curioſity, hee may ſpend more labour to leſſe purpoſe. Let euery man by beholding the *nationall vices* of other men, praiſe Almighty God for his owne happineſſe: and by ſeeing their vertues, learne to correct his owne vices. So ſhould our trauaile in this Terreſtriall Globe bee our direct way to Heauen: And that eternall guide ſhould conduct vs which can neuer erre: To whom be aſcribed all Glory, Prayſe, and Power, for euermore.

Deo triuni Laus in æternum.

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